

# The AUTOMOBILE

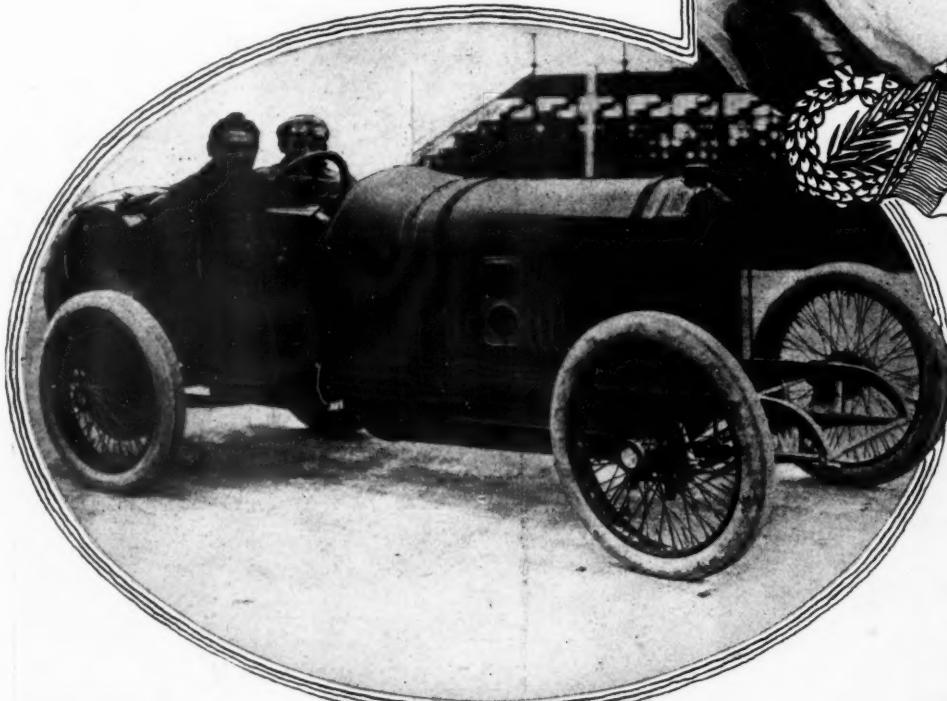
## Boillot Again Wins Grand Prix

Peugeot Cars Come in First and Second—Fuel Consumption Limitation Does Not Bother the Contestants, Who Average 16 Miles Per Gallon

By W. F. Bradley

AMIENS, FRANCE, July 12—*Special Cable*—Today one more victory was added to the Peugeot string when Georges Boillot, dashing over the 569-mile course at the rate of more than 72 miles an hour, captured the Grand Prix. Closely on his heels followed the runner-up, and as it flashed past the finishing stand the spectators rose to their feet and cheered. It was another Peugeot driven by Goux, the winner of the 500-mile event at Indianapolis on Decoration Day.

Following in close succession came Chassagne in a Sunbeam, Bablot and Guyot in Delages, Resta in a Sunbeam, Cham-



Boillot's winning Peugeot car, with Boillot at the wheel



Georges Boillot,  
the winner of two  
Grand Prix races

poiseau, Christiaens, Thomas, Croquet and Hornsted, respectively, in Th. Schneider, Excelsior, Th. Schneider and two Excelsior cars.

All of the competitors finished easily within their fuel limit, not .6 gallon difference separating the consumption figures of Boillot, Goux, Guyot and Bablot. The allowance of 14.1 miles to the gallon of gasoline was more than sufficient to allow the contestants to cover the course. The average fuel consumption of the winner was 16 miles to the gallon. Goux, who came in second, used 16.6 miles to the gallon.

After a delayed start, owing to a heavy fog, the racers were sent on their long grind. The weather was



Jules Goux, the famous Peugeot driver, second at the finish with an average speed of 71.7

Bablot, whose Delage car crossed the line fourth at an average speed of 68.8 miles

Chassagne, who drove the English Sunbeam into third place at an average speed of 70.3 miles

hot and there was no wind. In the first lap the Opel and Pope's Itala went out with burned-out bearings. Delpierre, driving the third Peugeot, went off the road at Boves, which put him out of the race. Another accident which threatened to be serious occurred when Moriando overturned and threw the car into the cinder banking at the stands. With admirable pluck he righted the car and, in spite of the bent steering gear, continued in the race.

During the early part of the race Goux held the lead, followed closely by Chassagne, Guyot and Boillot. In the eighth round Guyot secured the lead and maintained it for eight laps, when suddenly his tire burst and forced him to stop. Before the car had stopped his mechanic jumped out and was run over by the machine. Guyot picked him up and drove back with him slowly to the stand, where he secured a new mechanic, changed his tires and continued in the race. This is the only stop he made during the entire race, but he was unable to regain the lost time. Boillot took up the lead in the seventeenth lap with Goux, Chassagne and Guyot hot on his heels.

Boillot had been holding back during the first half of the race but during the last ten laps he forced his car as much as he dared. At times on the straightaways he was traveling over 100 miles an hour. The record lap, however, was held by Bablot in a Delage, who made an average of 77.5 miles an hour.

The tragedy of the day occurred when Guinness broke a wheel at Boves and shot into the river. The driver was unhurt, but an unfortunate spectator was instantly killed. Minor mishaps of various sorts were noted during the race. Nazzaro broke his spring reaches. Moriando had a seized universal joint. Cailliois broke a torque member. Resta was delayed through a leaky reserve oil tank.

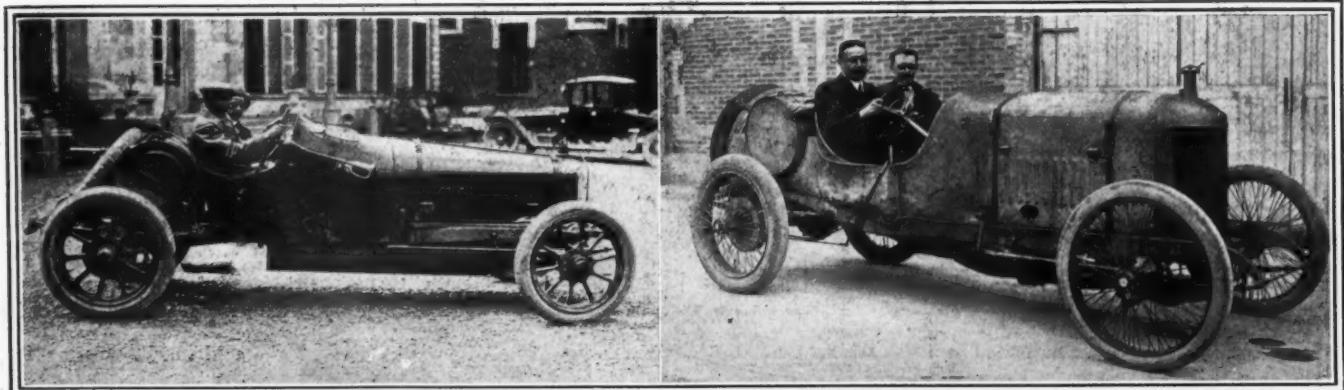
Comparatively little tire trouble was suffered. Boillot changed once and Guyot changed four times. The accompanying table, page 94, shows the fuel consumption of the leading cars.

It is worth noticing that automatic carburetors were used on all the cars. Claudel has supplied all the makes but two. In the case of the Sunbeams the intake pipe is water jacketed from the circulating system, but on most of the others, including Peugeot and Delage, there is no heating appliance whatever.

With a distance of 569.68 miles to be covered, the amount of gasoline given to each car in the French Grand Prix was 40.3



Front view of Boillot's winning Peugeot



The stream line Sunbeam, with Chassagne at the wheel. The Delage racer with Bablot up



Guyot, driver of the second Delage entry, which was fifth at 68.6 miles per hour

Darius Resta, second in the Sunbeam team, gaining sixth place, at 68.2 miles per hour

Champoiseau, whose Th. Schneider arrived seventh at the finish, at 65.2 miles per hour

gallons, being at the rate of 14.12 miles per gallon. The whole of the fuel had to be taken on board at once and placed in a circular section tank with two vertical divisions to prevent swinging of the liquid. These tanks are a standard pattern imposed by the club and had to be placed at the rear of the driver's seat without any covering over them. The gasoline line must also

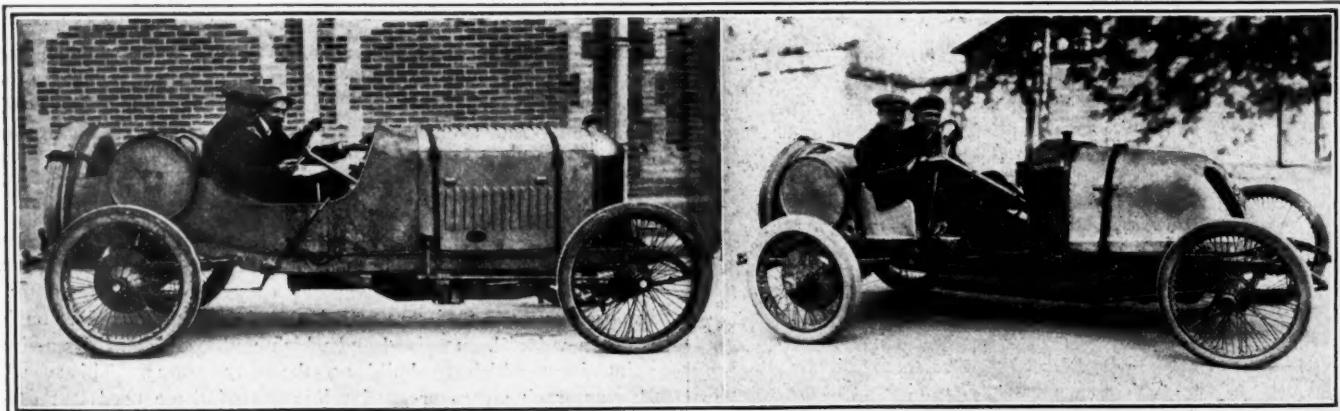
be entirely external, and on most of the cars is placed along the right-hand side frame member and is either thickly wrapped with adhesive tape or has small blocks of wood placed between it and the frame to cut out vibration. The gasoline is measured by being placed in a funnel-like tank tested by the government weights and measures department. The allowance is made at a temperature of 15 degrees Centigrade, correction being made for any increase or decrease over this temperature. From the funnel tank the fuel is allowed to flow directly into the car tank, the car having been backed immediately under the measuring instrument. By this method every drop of fuel placed in the measuring tank reaches the car tank, and as soon as the supply has been obtained the filler caps on the tank—for there are three of them—are sealed. If this seal was broken the car was eliminated from the race. The carburetor was also sealed, as well as the gasoline line and all connections.

Competitors were given the privilege of choosing their own gasoline from about eight or nine well-known makes on the French market. The fuel was bought by the French club in the usual 5-liter sealed cans and the seals of these cans were broken only in the presence of competitors immediately before pouring into the measuring instrument. Facilities were allowed to prevent impurities or water getting into the tanks. The commercial brands of gasoline employed have a density varying from 715 to 720.

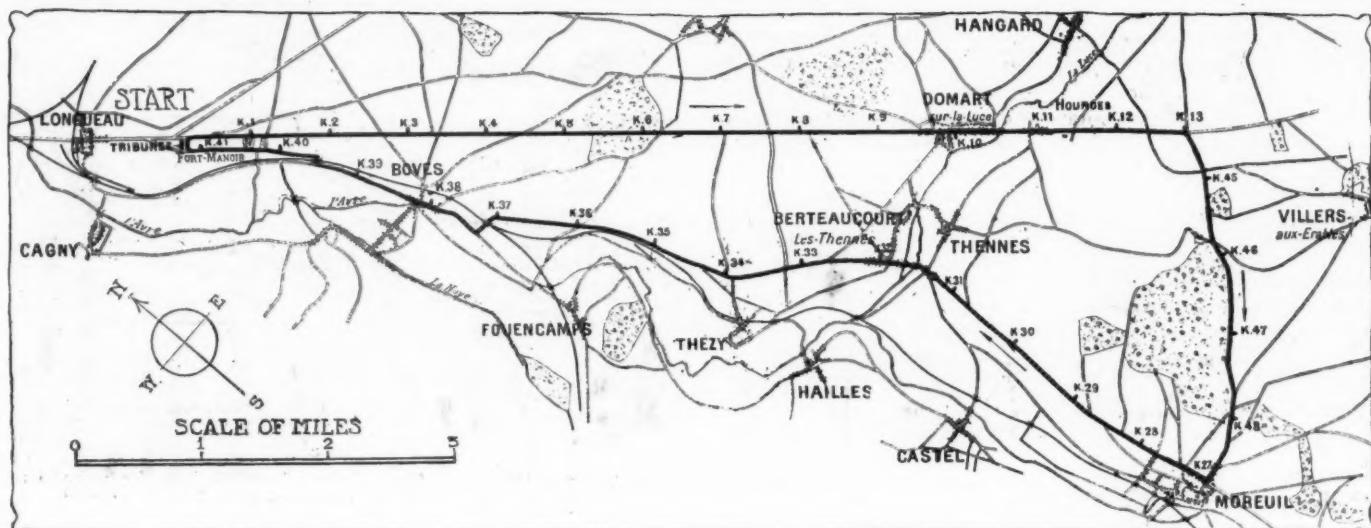
This year's race is the second one held in France on a fuel consumption basis. The first of this kind was run at Dieppe in 1907, when the allowance was at the rate of 9.4 miles to the gallon. Nazzaro, on a Fiat, was the winner on that occasion, and his average speed for a rather shorter distance than covered this year was 70.5 miles an hour. Although the fuel supply has been cut down one-third, this year's cars beat those of 6 years ago by nearly 2 miles an hour average speed. There is even a pos-



The Sunbeam, piloted by Darius Resta



Guyot's Delage, with Michelat, designer of the car. One of the Th. Schniders, with Champoiseau at the wheel



Map of the triangular course near Amiens, over which the Grand Prix was run

## Gasoline Consumption in Grand Prix

Driver	Car	Gallons Used	M.P.G.
Bollot	Peugeot	35.5	16
Goux	Peugeot	34.2	16.6
Guyot	Sunbeam	34.8	16.3
Bablot	Delage	34.2	16.6

sibility that this year's racers will prove faster than those of last year, when absolute liberty was allowed. In 1912 the late David Bruce Brown finished the first day's race at Dieppe at an average of a little more than 72 miles an hour. For the total distance the speed was 68.5 miles an hour. Close comparison, however, is not possible, for the distances are not the same and a certain amount of time was lost last year in getting the cars away on the second day.

The twenty competitors in the race at Amiens were brought to the official enclosure on the course the day before the start, where they were weighed and the tanks filled. The weight restrictions were a minimum of 1,763 pounds and a maximum of 2,425 pounds, without tools, oil, gasoline, or water. The committee had the right to cause crankcases to be emptied. When the tanks were filled and sealed the machines were pushed into separate lock-up boxes, where they were guarded by soldiers until the time for bringing out on the morning of the race. The start of the race was fixed for 5 a. m., the competitors to get away at intervals of 1 minute, but the fog delayed this.

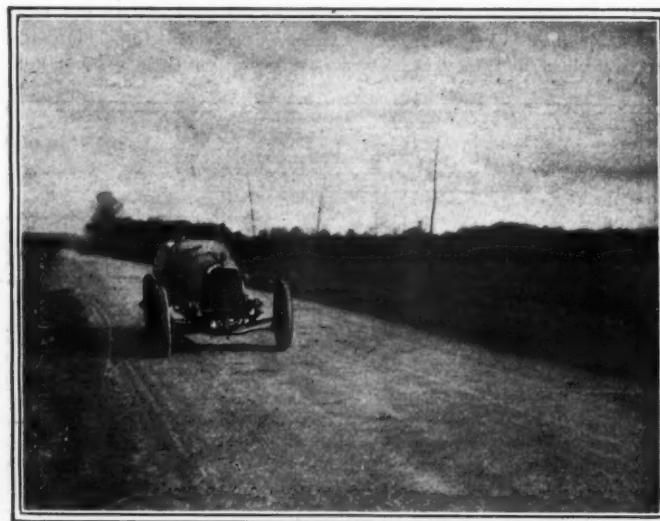
The special banked track uniting the two main legs of the course was used for the start. This is a banked cross-road 220

yards in length, straight along its central portion, with the two ends rounded off. It is built of concrete rich in cement, and has on the outside the grandstands, press stands, various offices, etc., and on the inside the line of tire pits. As the tanks were filled and sealed before the start of the race, there was no gasoline in the pits. The work was thus confined to changing tires and supplying oil and water when needed. No limitation was placed on the amount of oil consumed in the race. It was at first proposed to hold the car down to a reasonable supply of lubricant, but, owing to the technical difficulties in the way, this idea was abandoned. All work must be done on the cars by the driver and his mechanic; the pit attendants have to confine themselves to handing up whatever articles are required.

The track with grandstands built around it is an innovation in French automobile racing. This idea was adopted in order to avoid a difficult hairpin turn and also to give the facility of arranging the stands so that spectators could arrive and depart while the race was in progress. It was found cheaper to buy the land than to rent. Thus the whole of the tongue of ground between the two almost parallel main legs was secured by the racing board of the French club. The pits, as already explained, are on the inside of the straight section of the cross-road, and have a depth of about 5 feet. Immediately in front of the line of pits is a slightly raised sidewalk covered with fine cinders and having a granite curbing. This surface gives a good foothold to driver and mechanic when working on the car, and the curbstone is sufficiently high to prevent a car skidding over into the pits. On the outside of the concrete track is a wall of finely sieved cinders mixed with metal shavings, to act as a buffer in case a car gets out of control. This banking is continued right around the two ends, there being a safety zone behind it, then stout boardings. The grandstands being on slightly higher ground, the spectators can look over the banking into the pits on the opposite side of the track. A tunnel under one end of the track gives communication between the stands and the pits. The timer's box is placed at the entrance to the banked turn: the time is thus taken before the stoppage at the pits, giving the driver the advantage of a fast lap.

The twenty cars in the race represented France, England, Germany, Italy and Belgium, the respective teams being Peugeot, Delage, Schneider, for France; Sunbeam for England; Opel and Mathis for Germany; Itala for Italy, and Excelsior for Belgium.

Peugeot had a certain advantage over the other competitors in possessing a set of cars on which a large amount of valuable experience had been gained and which could serve as the starting point from which to build up the 1913 racers. This year's Peugeot racing cars are a development of those used last year and which won the French Grand Prix, Sarthe race, Mont Ventoux and Gaillon hill climbs, Brooklands records, and Indian-

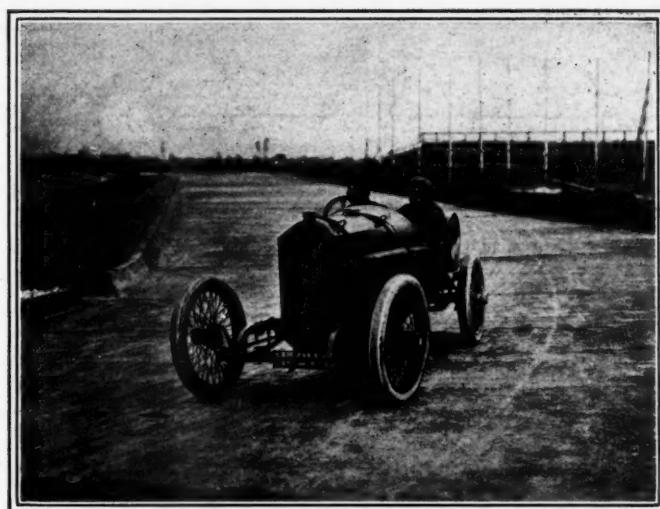


Typical view on the course in the open

apolis 500-mile race. They are the production of the same engineers, the Peugeot racing department being in the hands of Georges Boillot, assisted by Engineer Henri, the late Paul Zuccarelli and Jules Goux.

Last year, with no limitation on the size of motors, the Peugeot men were content with the comparatively small motor of 110 by 200 millimeters, which proved to be the fastest road racer in the world. After a full year's work these cars have remained unbeaten in all kinds of contests from half-mile hill-climbs to 800 miles on the open road. The restriction in the amount of fuel allowed for this year's Grand Prix made it necessary to cut down the motor size considerably, but with this restriction the Peugeot men have proved that they can obtain the same power and speed as was secured from last year's cars.

This year's cars are improvements on the two racers which appeared in the Indianapolis 500-mile race. Most of the details have been changed, but all the outstanding features are the same. The cylinders are in a block casting of 3.9 by 7.08 inches bore and stroke. The valve arrangement is the same as on last year's cars, there being four valves per cylinder inclined in the head and operated by inclosed overhead camshafts, each cam working within an eccentric forming a stirrup-shaped member with a stem-forking valve tappet. The changes are an improvement in the method of guiding the eccentric, and the placing of the return spring inside the camshaft housing instead of outside it. The valve timing is distinctive, there being a lead to the admission, so that inlet and exhaust valves are open together for a brief period. Details of this have not been given out. Each camshaft is entirely independent and can be lifted away from the long bolts projecting from the cylinder head complete with its camshaft pinion. Last year a vertical shaft with bevel gearing was used to drive the camshafts. In some of the races a little trouble developed with this, and for greater



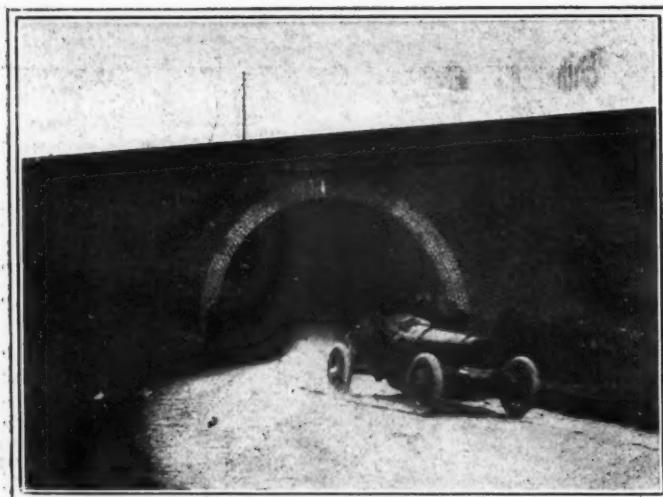
The new banked cement bend at the grand stands

#### TABULATION OF RESULTS OF FRENCH GRAND PRIX

Driver	Car	Time	Miles per Hour	Speed
Boillot	Peugeot	7:53:56	.72.1	
Goux	Peugeot	7:56:22	.71.7	
Chassagne	Sunbeam	8:06:20	.70.3	
Bablot	Delage	8:16:13	.68.8	
Guyot	Delage	8:17:58	.68.6	
Resta	Sunbeam	8:21:38	.68.2	
Champoléau	Th. Schneider	8:44:37	.65.2	
Christiaens	Excelsior	8:57:23	.63.6	
Thomas	Th. Schneider	9:04:00	.62.8	
Croquet	Excelsior	9:12:56	.62.0	
Hornsted	Excelsior	9:37:40	.59.2	

#### CHARACTERISTICS OF CARS ENTERED IN FRENCH GRAND PRIX, AMIENS, JULY 12

Car	Driver and Number	Cylinders	Bore and Stroke	Magneto	Carbureter	Valves	Main Bearings	Lubrication	Cooling	Clutch	Drive	Gear Ratio	Tires	Tire Sizes	Wheels	Weight Lbs.	Wheelbase Tread Inches
Delage..... (France)	2 Bablot..... 10 Guyot.....	4 mono-bloc	4 by 7.08	Bosch, also spare Bosch	Claudel	Horizontal in head, 4 per cylinder	Five ball	Forced feed, low pressure	Pump no fan	Multi-disks	Shaft, no torque or radius rods	2.4-1	Continental	Rear 880x120 870x90	Rudge	2090	108 51
Excelsior..... (Belgium)	5 Christiaens..... 11 Hornsted.....	6 sets of three	3.5 by 6.29	Bosch	Claudel	One side 2 per cylinder	Seven plain	Forced feed	Pump	Leather cone	Shaft, torque, tube	1.88-1	Palmer	Rear 880x120 875x105	Adex wire detach.	1980	104 51
Itala..... (Italy)	7 Nazzaro..... 13 Pope..... 17 Moriondo.....	4 pairs	4.9 by 6.6	Bosch	Itala automatic	Itala rotary	Five plain	Forced feed	Pump	Multi-disks	Shaft, torque, tube	2.5 to 1	Continental	Rear 880x120 875x105	Rudge	2310	118 53
Mathis..... (Germany)	4 Esser.....	4 mono-bloc	2.7 by 5.5	Bosch	Claudel	One side L-type	Three plain	Forced feed	Pump	Multi-disks	Shaft	2.8 to 1	Continental	765x105	Riley	1763	96 51
Opel..... (Germany)	3 Joerns.....	4 mono-bloc	3.5 by 6 ins.	Bosch	Opel	In head, inclined 45 degrees 2 per cyl.	Five plain	Forced feed	Pump	Leather cone	Shaft	2.4-1	Continental	880x120 875x105	Rudge	2000	110 53
Peugeot..... (France)	8 Goux..... 14 Boillot..... 18 Delpierre.....	4 mono-bloc	3.9 by 7.08	Mea	Claudel	Inclined in head 4 per cyl.	Three ball	Forced feed, low pressure	Pump no fan	Inverted cone Ferrodo lined	Shaft, no torque or radius rods	2.3-1	Pirelli	Rear 880x120 875x105	Rudge	1980	106 53
Schneider..... (France)	6 Croquet..... 12 Gabriel..... 16 Champoléau..... 20 Thomas.....	4 mono-bloc	3.77 by 7.48	Bosch	Claudel	One side, stems inclined, 2 per cyl.	Three plain	Forced feed, high pressure	Thermo syphon no fan	Leather cone	Shaft, torque, tube	2.43-1	Continental	Rear 880x120 750x90	Rudge	2128	110 55
Sunbeam..... (England)	1 Caillois..... 9 Resta..... 15 Chassagne..... 19 Lee Guinness.....	6 sets of 3	3.14 by 5.9	Bosch	Claudel	One side, stems inclined, 2 per cyl.	Seven plain	Forced feed, high pressure	Pump no fan	Leather cone	Shaft, no diff. Torque member	2.5-1	Dunlop	Rear 880x120 815x105	Good-year steel detach.	2200	118 54



Caillols' Sunbeam coming out of railway bridge at Boves

security a train of spur pinions is used, there being three intermediates between the crankshaft and camshaft pinions. This train of gears is inclosed in a very light and neat aluminum housing carried on studs projecting from the top of the cylinder group, but sufficiently removed from it to be practically isolated from its heat. The cams are solid with the shafts. Water circulation is by means of a centrifugal pump, without the use of a fan, the pump being worked off a cross-shaft. This year, for the first time, a Mea high-tension magneto is employed; the plugs are placed directly in the cylinder head.

The cylinders of the Peugeot racer are a block casting with integral intake manifold, but independent exhaust manifold. There is a very short, straight length of intake piping between the Claudel carburetor and the manifold proper. This carburetor is not heated in any way. As on the Indianapolis racer, there is a wire gauze air intake and a hand hole through the side of the bonnet opposite the carburetor. Last year's three-point suspension has been preserved with detail modifications. The sub-frame forms an elongated U with a trunnion attachment at the front and a ball and socket attachment at each extremity. These rear attachments are not entirely rigid, but have a spring connection similar to that of the fore and aft connecting-rod of a steering gear. The sub-frame carries motor and gearbox, there being a universal joint between these two units.

One of the distinctive features of the Peugeot racers is the lubricating system. No oil whatever is allowed to remain in the crankchamber. Working from one of the intermediate pinions at the front end is the motor in an oil and air pump which maintains pressure on an oil tank under the driver's seat. By reason of the pressure, the lubricant is driven out of the tank

to six sight feeds on the dash and from them by suitable leads to the motor bearings. A large quantity of oil is sent through, all the pipes being of large diameter. As the oil works out of the bearings and drops into the crankchamber, it is taken up by the pump and driven back to the oil tank. When there is no oil in the base chamber, the pump delivers air to the tank. A considerable amount of ingenuity had to be expended in designing a pump which would deliver oil or air, as required, and which would not seize when deprived of oil. From the long tests which have been carried out, this lubricating system gives entire satisfaction. The bearings can be flooded with oil, but it is impossible to make the motor smoke. The oil also keeps considerably cooler, for it is in a tank isolated from the heat of the motor and is allowed to cool in its passage to and from the motor. On the main feed pipe admitting to the sight feed is



Joseph Christiaens, Excelsior. Rene Thomas, Th. Schneider

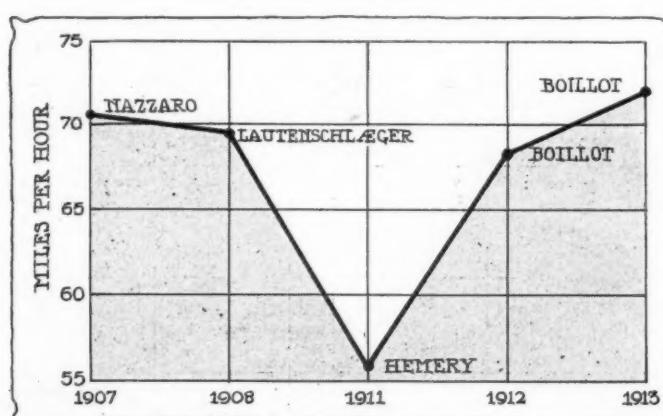
a cock which on being closed cuts off the ignition. Thus, when the motor is stopped there is no possibility of the pressure in the tank forcing the oil out through the sight feeds until atmospheric pressure is established. Under this system of lubricating the amount of oil consumed has been reduced to a minimum.

The hollow crankshaft, which is built up of BND steel, is carried on three S.R.O. bearings, the front and central bearings being single and the rear one double. The balls have a diameter of 1 inch. Pistons and connecting-rods are machined out of BND steel, the rods being of I-section and very light. Although steel pistons are used there is no special oil lead to the cylinder walls, it being found that the lubricant working out of the bearings is quite sufficient. Compression is very little above the normal. With the exception of the crankshaft plain bearings are used in the motor, the connecting rod ends being lined with white metal.

The flywheel is somewhat lighter than usual. The clutch is an inverted cone type, the female member being ribbed to give additional stiffness, owing to the light construction. Four speeds are provided in the gearbox, the whole of the selector mechanism being inside the box. The main shafts are hollowed out and all gears are cut out of BND steel. Final drive is by propeller shaft with two universal joints fitted with ball bearings, and a bevel gear rear axle having a reduction of 2.3 to 1.

The rear axle, as on last year's model, is built up of two steel tubes machined out of the solid, with a central aluminum differential housing. This year's axle is not trussed. There are neither radius rods nor a torque tube, the springs only being relied on for taking the drive and the reaction. Instead of being outboard, the rear springs are immediately under the main frame members, and also under the rear axle. The two universals on the drive shaft are equipped with ball bearings. The rear springs are under the axle and are in the same vertical plane as the frame members. There is a pronounced kick-up over the rear axle.

The wheel equipment consists of Rudge-Whitworths fitted



Comparison of speed made this year and in previous Grand Prix

with Pirelli tires of 880 by 120 rear and 875 by 105 in front. The regulations impose a circular section gasoline tank back of the driver's seat and entirely exposed, with an external gasoline lead. This makes impossible any serious attempt at wind cutting. Nevertheless, very close attention was paid to the under-form, the pan being neatly shaped, having a decided upward sweep in front, and giving as large an amount of clearance as possible. The absence of an oil sump in the base of the motor facilitates the task of securing a clean underbody. A honeycomb radiator with all the angles rounded off is employed and the bonnet is continued by a scuttle dash. This car is smaller and lighter than last year's model. It scales 2,000 pounds without gasoline. The wheelbase is 106 inches and the tread 53 inches.

Not only are the Peugeot racers remarkable mechanical pro-

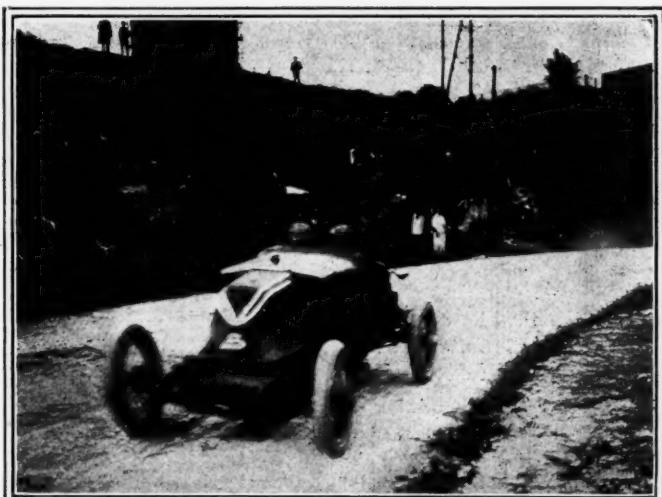


Croquet, No. 6 Th. Schneider. Hornsted, Excelsior

ductions, but they have been finished off in a way which would do credit to a show model. The front axle is lined with wood front and rear in such a way as to diminish head resistance and at the same time give a little extra solidity. The transverse connecting bar is treated in the same way. The underpan is absolutely clean-cut, for as there is no oil drainer and no sump to cool, it has been possible to make a one-piece pan without any openings. The radiator is very narrow, but flat surfaced; the bonnet is tapering and is followed by a scuttle dash, with inclosed sides for the driver's and mechanic's seats. If it had not been for the big official tank a very fine stream-line body would have been obtained. By means of a worm and screw, the rear brakes can be adjusted while the car is in motion, the mechanician lifting up a hinged trap in the floor boards for this purpose. The gasoline tank is fitted with a La Force indicator, and also with a pressure indicator. Pressure is only necessary to get the last drops out of the tank. Very close attention was paid to the question of weight, this being reduced to the minimum allowed by the rules.

Louis Coatalen, the designer of the Sunbeam racers, has adhered to standard features of design, but has introduced some important detail departures. The exact amount of compression has been kept secret, but it is admitted that the figure is exceptionally high. It is declared that when the drawings were prepared the compression of the motor was so high that doubt was expressed as to the ability of the motor to run at all, and provision was made for decreasing the compression as required. It was found, however, that the motor not only ran but ran very satisfactorily, a speed of 100 miles an hour being obtained with the regulation consumption of 14 miles to the gallon. The maximum speed of the motor is 2,500 revolutions, at which speed it develops 110 horsepower.

The cylinders are in two castings with all the metal cut away between the foot of each cylinder. Their dimensions are 3.14 by 5.9 inches. The casting is of the L-type with valve stems inclined to improve the form of the combustion chamber. Instead of the plugs being placed over the intake valves they are as



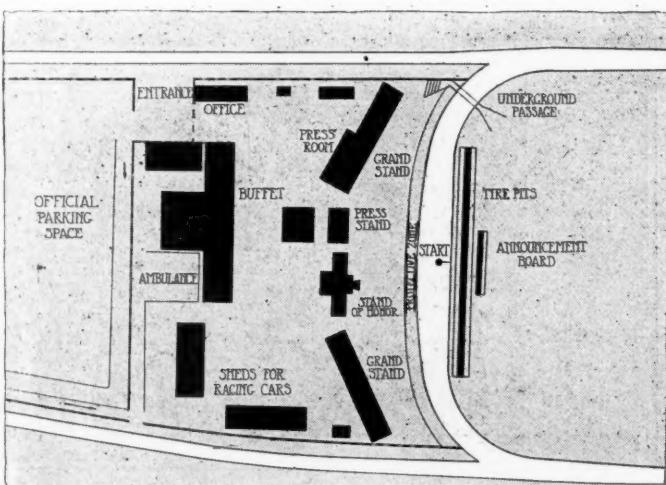
Thomas, making speed on the No. 20 Th. Schneider

near the head of the cylinder as the water outlet pipe will allow. A three-point suspension is used for the motor, the subframe having a trunnion attachment at the front and rigid attachment to the main frame members at the rear. Reciprocating parts are of Vickers steel, the steel pistons, complete with wristpin, but without rings, weighing  $\frac{7}{8}$  pound. Seven plain bearings are used for the crankshaft, oil being delivered to them under pressure; white metal is used for the connecting-rod ends. In common with the Delage and Peugeot racers, the flywheel is very light and is cone shaped to receive the clutch.

The feature of the rear axle is the abolition of the differential, the shaft being of chrome nickel steel with the crown bevel wheel mounted directly on it. The gear ratio on high is 2.5 to 1.

The carburetor is a Claudel modified to allow an excessively large amount of additional air being supplied at high engine speeds. The motor is an L-head type with the valve stems inclined outwards to improve the shape of the combustion chamber; the valves have been increased in diameter and are thoroughly cooled. Steel pistons, machined out of BND steel, supplied by the Derihon company, are employed, each piston with its wristpin, but without segments, weighing 14 ounces. Lubrication is under pressure, as on the standard models, the crankshaft being bored to carry the oil to the connecting-rod ends. Chain drive is used for the water pump and the magneto, and the radiator has considerably less width than those of the standard cars. The weight of the flywheel has also been decreased, this change being one adopted by other competitors,

(Continued on page 101.)



Detail of course, showing disposition of stands

# England Wins First Cyclecar Grand Prix

**New Miniature Cars Provide Excellent Sport in Sharply Contested Race—Winner Covers 163-Mile Course at 42 Miles per Hour**

AMIENS, FRANCE, July 13—  
*Special Cable*—The first cyclecar race ever held in Europe was run on the Grand Prix course here today and resulted in a win for an English vehicle, the Morgan, which covered the distance of 163 miles in 3 hours 53 minutes at an average speed of 42 miles per hour. The victory was a narrow one, the French Bedelia crossing the line only 3 minutes later.

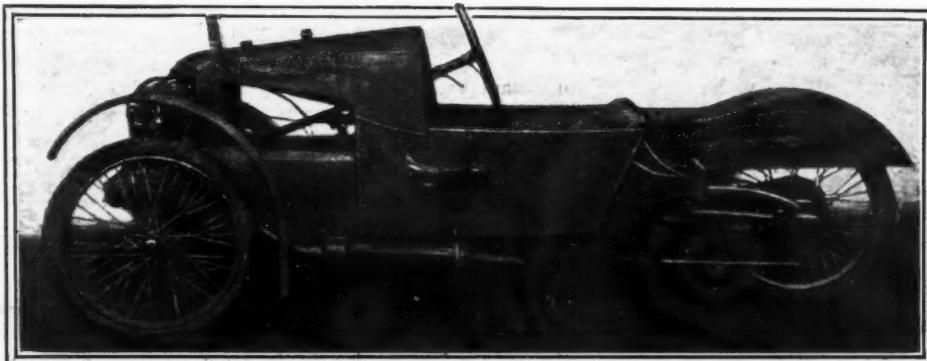
In all thirty-eight of these miniature vehicles entered for the first cyclecar Grand Prix, good sport was shown and the machines displayed a wonderful degree of stability even when turning at high speed. There was only one case of overturning, this being one of the Bedelias at a difficult turn near the railway bridge at Boves. No serious injuries resulted from the mishap.

Besides the cyclecar proper the field of contestants included motorcycles with attached sidecars, but these machines made a poor showing, only one out of five finishing.

The winning car was driven by W. G. McMinnies and was one of a team of four Morgans. The Bedelia was also represented by a four-team, the leader being in the hands of Bourbeau, the designer of this make.

Hot weather conditions prevailed at the start and the machines were sent off in batches on the new 40-foot crossroad in front of the grandstands. Bourbeau set the pace for the first four laps, followed by the Marlborough with Samuelson at the wheel. This latter car retired later owing to overheating troubles. The only German entry, a Mathis, showed a fine pace and finished ninth but was disqualified for having lost a mudguard during the running. McMinnies came to the front at the eighth round, having suffered some delay through tire trouble. A fine struggle took place between McMinnies and Canouel on the Sphinx-Globe.

Violet also put in some good work among the leaders and actually got in at the finishing line a few seconds behind the winner but was disqualified on the rule requiring that mudguards remain in position throughout the race. The loosened fender



The winning three-wheeled Morgan cyclecar, driven by McMinnies

on Violet's machine was carried six laps by his mechanic in the hope that the rule referred to actual loss of the fender.

The course for the cyclecar event started from the same point as the Grand Prix but was shortened by cutting across the two sides of the triangle, as shown in the accompanying plan. The total distance covered was 163 miles, being fifteen times around the triangular course measuring 10.9 miles. Among the conditions of the contest were the following:

Every machine must carry a passenger and all the work must be done by these two persons. Detachable wheels are allowed, on condition that these wheels are on the machine at the beginning and the finish of the race. It is not allowed to ... a wheel with a punctured tire for one with a fully inflated tire.

Unlike the big car race, there was no fuel limitation, the speed contest being open to any machine of not more than 67.1 cubic inches cylinder capacity, weighing not less than 385 pounds empty, nor more than 661 pounds. If the body is not detachable the total weight must not exceed 771 pounds. As the table shows, France and England provided practically all the starters, the only other nation represented being Germany with a single car.

The machines entered in this race present a considerable amount of variety, thus allowing for very interesting comparisons on practically every feature of design. Twin-cylinder motors predominate, these being of both the air and water-cooled variety. There are a certain number of water-cooled four-cylinder motors, but very few single-cylinder models. Every possible combination of drive is to be found among the competing machines. They vary from the orthodox car lines with clutch, gearbox and shaft with bevel gearing to various combinations of chain and belts and belt and chain, with and without gearsets.

Officially, a cyclecar is a motor vehicle having a motor not exceeding 1,100 cubic centimeters cylinder capacity and weighing not more than 661 pounds bare chassis, or 771 pounds if the body is not detachable. Such a definition leaves manufacturers plenty of liberty, and they have not been slow to take advantage of it, as the thirty-eight machines entered in the Cyclecar Grand Prix demonstrate. Manufacturers have not yet determined which type of vehicle is best fitted for the class of work required of a cyclecar. Although a race such as the Grand Prix will tend to eliminate unsuitable types and thus make towards uniformity of design, there are no indications of a stereotyping of design. Plans have been laid next season for the production of



Bourbeau, designer of the original French cyclecar, the Bedella. Bourbeau finished a close second

hundreds of thousands of cyclecars in France and England, but among the makers who are preparing for this big business there is no uniformity of design whatever. European manufacturers have a habit of building unnecessarily heavy, and there is a feeling that the official weight limits are unnecessarily low. Probably when the official rules come to be revised there will be discussion on this point and a strong attempt to get the limit raised. The Grand Prix race will be a powerful argument against such a change, for it will prove that while some makers have to drill out every part that is drillable, and have to wash down with gasoline after a race to get within the weight limit, there are others with machines of equal power, speed, and carrying capacity which are very close to the minimum weight of 385 pounds. If these makers can build light the others can do the same. Weight is the enemy of the cyclecar.

A twin air or water-cooled motor, chain transmission to a countershaft carrying variable pulleys, and final drive by belts is the type of cyclecar most strongly in evidence. This is really the original cyclecar, as devised by Bourbeau & Devaux, and put on the French market under the name of Bedelia 6 years ago.

The winning machine and its three team mates are distinctive in that they are three-wheelers, driving on the rear central wheel. Owing to this construction they were registered in the sidecar class. Two of the Morgans, the one driven by McMinnies and that driven by H. F. S. Morgan, were equipped with J. A. P. two-cylinder engines, water cooled, with overhead valves. The engine occupies a position right forward with the radiator behind. A wire screen immediately in front of the engine acts as a protection against flying stones.

For the purposes of the race Bedelia has made several improvements, and although the model is at present produced for racing purposes only, it ought to have an important future for all-around touring work. The motor is a twin-cylinder air-cooled V-type of 3.3 by 3.7 inches bore and stroke, carried in the front end of a narrow wood frame and mounted on rails. The crankcase hangers are bored out and lined with bronze sleeves receiving a pair of stout steel tubes mounted on the top of the frame members. The motor has thus a fore and aft travel of about 4 inches, and can be locked in any position by worm gearing controlled from the driver's seat. The gasoline tank is a cigar-shaped organ mounted right above the motor, the connection to the carburetor being by flexible tubes. The oil pipes are also flexible. The motor shaft, carried in big diameter ball bearings, has at each extremity a special type of automatic expanding pulley. The drive is direct from the motor to the rear wheels, as on a motor bicycle. The weight of the chain and countershaft is abolished, friction is reduced and the long belts give a remarkably easy drive. The pulleys have their inner cheek permanently attached to the shaft. The outer pulley is controlled by an encased centrifugal governor. As the speed of the shaft increases the cheek is driven inwards toward the fixed

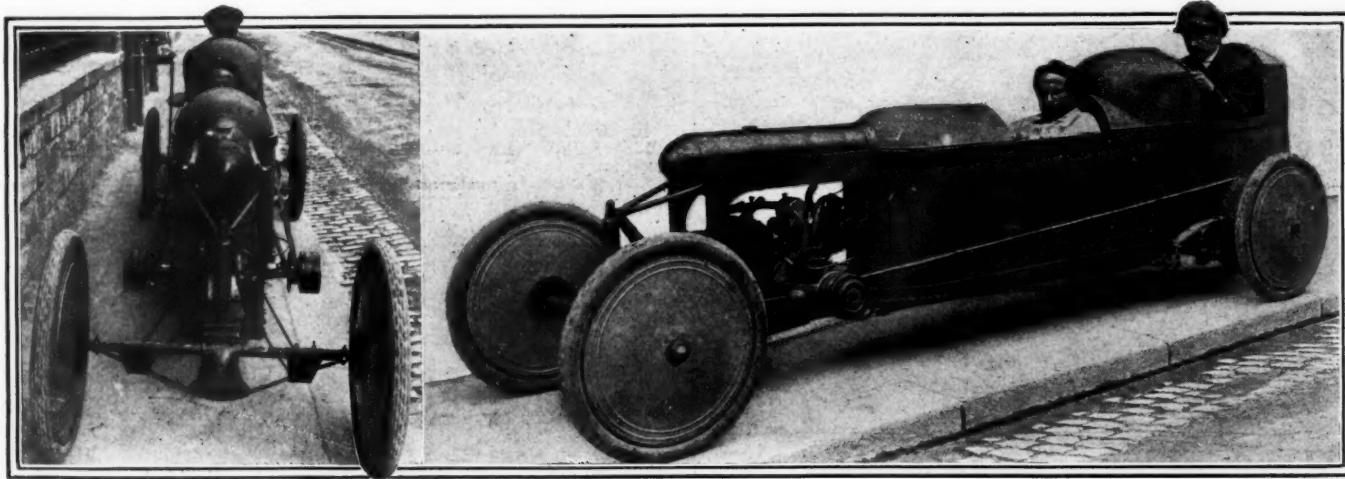
**FINISHERS IN CYCLECAR GRAND PRIX HELD  
JULY 13**

Driver	Car	Time	Average Miles Per Hour
W. G. McMinnies	Morgan	3:53:09	42
Bourbeau	Bedelia	3:55:54	41.7
Canouel	Sphinx-Globe	4:05:11	40
Ronteix	Ronteix	4:11:16	39
Peyrecave	Duo	4:12:24	38.8
Leveque	Super	4:12:32	38.7
Pouillez	Violet-Bogey	4:16:47	38.2
Jolibois	Ronteix	4:30:15	36.3

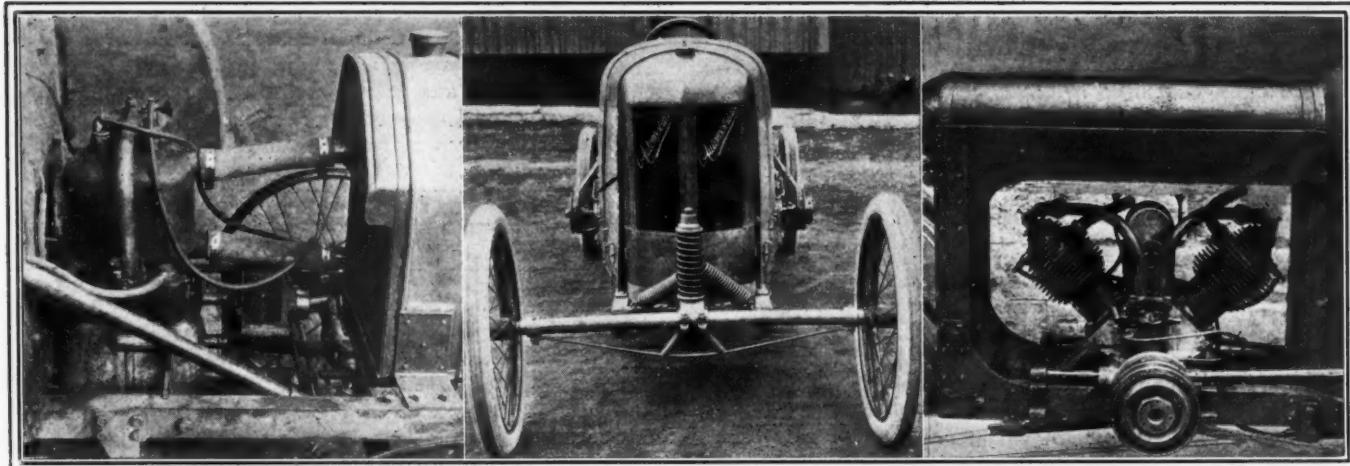
member, causing the belt to ride higher. As the speed falls off, the cheek opens, giving a lower gear ratio. The standard type of pivoting back axle is maintained, this allowing for the tensioning of the belts, and in addition the driver has the advantage of advancing or drawing back his motor to get further adjustments of his belts.

The rear pulleys are not attached to the road wheels, as is usual, but are mounted independently on the rear axle and have a ball bearing at each side of them. This of course brings the belts closer to the body. Wire wheels are used, but they are covered with aluminum disks to diminish resistance. The track is narrow and the body is cut down to the lowest possible width by placing the occupants of the machine tandem fashion, the driver being at the rear. The motor, an air-cooled twin, is standard so far as dimensions are concerned, but has light steel pistons, light I-section connecting rods, big diameter valves, and special timing. It has no fan, the rush of air through the opening in the front of the narrow bonnet being sufficient to cool it. The magneto is a Ruthardt, mounted in the space between the two cylinders and driven by exposed chain. The carburetor is a Longuemare with common float chamber and two independent jets, one for each cylinder. Intake valves are automatic and mounted above the exhausts. Castor oil is used as a lubricant. Steering is by means of steel cables wound around a bobbin, the cables being passed through fiber tubes where there is any possibility of chafing. The stouter of the two cables is maintained in tension by a coil spring. If this cable should break the second one comes into operation.

Automobilette is a direct development of the Bedelia idea, but has been refined and in a certain measure complicated in order to meet the demand of tourists. The motor, a four-cylinder monobloc casting, water cooled, has been adopted because of the objection that an air-cooled model is apt to overheat when used for city work. There is nothing particularly distinctive in the motor, it being L-type casting, has chain-driven cam and magneto shaft, and forced feed lubrication. Power is transmitted by means of propeller shaft and bevel gearing to a countershaft with mechanically controlled expanding pulleys. As there are two driven pinions on the countershaft, this arrangement allows of both ahead and reverse. Gear ratios are secured by the dis-



Bourbeau's Bedelia. Note tandem arrangement of seats, long belt-drive and novel suspension of braced front axle



Left—Two-cylinder block engine of the friction-driven Violet-Bogey cyclecar. Center—Front suspension of Automobillette. Note main spring and auxiliary tilting springs. Right—The V-type engine on the Bedelia can be moved bodily forward while driving

placement of the pulleys and the pivoting rear axle. A second model has been entered in the race with twin water-cooled motor, chain drive to countershaft, and final drive by belts. The seats are staggered, the passenger being slightly to the rear of the driver. Steering is by rack and pinion on the four-cylinder model and by bobbin and steel cables on the twin.

An entirely different type is found in the Violet-Bogey. This has a twin water-cooled motor, shaft, friction disks, and final drive by single chain. Externally it is on big car lines, with the seats side by side and slightly staggered for the race. The motor is rather distinctive, for it is a modification of the standard model declared to have developed 22 horsepower on the bench at a speed of 2,500 revolutions. The cylinders are vertical in one casting, with valves superimposed and all mechanically operated, the diameter being 40 millimeters. The two crank pins are in one plane, and the crankshaft is mounted on big diameter ball bearings and has heavy internal balanced flywheels. Very light I-section BND connecting rods are employed, and the pistons are an alloy in which aluminum predominates. The design is such that as the pull on the chain increases the adherence between the two friction plates increases. Detachable wire wheels of only 20 inches diameter are used in the race.

#### Sphinx-Globe Drives by Belt

Transmission of power by means of a flat belt is the predominating feature of the Sphinx-Globe machines. On the engine shaft is a 6-inch diameter flanged pulley receiving a long 4-inch flat belt by which power is transmitted to a second pulley towards the rear of the frame. This second pulley is carried in a cradle

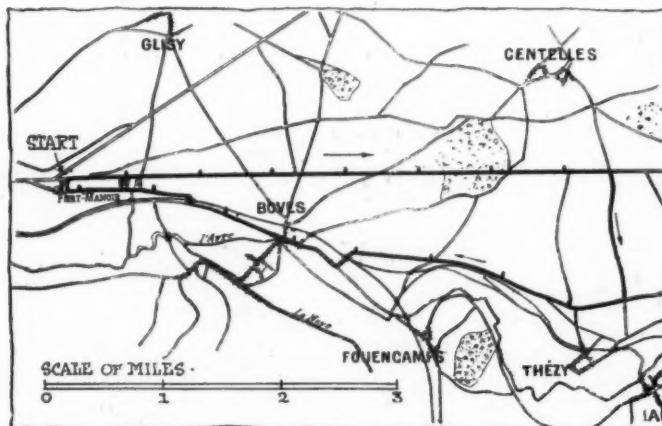
in which a spiral spring tends to push the cradle backwards to keep sufficient tension on the belt. In this second pulley is a two-speed and reverse epicyclic gear. Final drive is by a single chain. The racers have entirely different motors. One is an air-cooled single-cylinder built by Anzani and really of the aviation type. It has very big internal flywheels, and superimposed mechanically operated valves. The second machine has an English short-stroke water-cooled J.A.P. engine of the V-type. Steering is direct on both machines.

There are only two racers built entirely on car lines. One is the Marlborough, a French production entered by an Englishman, and the other the German Mathis. In each case these machines have four-cylinder water-cooled motor, cone clutch, gearbox, propeller shaft and bevel type rear axle. They are practically big cars in miniature. La Roulette, Super, and Du Guesclin are all on Bedelia belt-driven lines, without any very distinctive features.

Ronteix has worked on more original lines, for his four-cylinder cyclecar transmits by shaft and spur pinion to a countershaft, from which the drive is taken by a single chain to the rear axle. The crown wheel has three sets of gears cut on its face, and the driving pinion has a sliding motion allowing it to be brought into engagement with any one of these three. Steering is by means of mobile eccentrics.

As a whole the English cyclecars in this race have a more intimate connection with the motorcycle than the French machines, and have more the appearance of four-wheel motorcycles than of small cars. Two Duos were entered in the race, similar in general lines but differing in the power plant. Both engines were of J.A.P. make, one being an air-cooled V-type engine with the cylinders set at 90 degrees and the other a water-cooled engine with the cylinders at 50 degrees. A striking feature of the chassis construction on these cars is the rear suspension and the method of attachment to the main chassis members. These latter are made up of two pieces of ash strengthened with strip steel so that a girder construction is formed. Quarter elliptical springs are attached to the rear ends of the frame members, below which radius rods pass to the rear axle. A deviation from the larger car practice is the fitting of two carburetors, one for each of the two cylinders. The drive is by chain to a countershaft and from there by rubber belt to the rear wheels. By an ingenious arrangement of levers the back axle can be moved as a whole, so that belt tensioning adjustment can be made while traveling. And this is done without in any way affecting the action of the springs when the car is running.

On the G.N. machines the air-cooled motor is set across the frame; it has clutch and shaft drive to a countershaft, then three short chains, giving first, second and third speeds, to a second shaft, with final drive by belts.



Map of the Amiens course, followed by the cyclecars. This is a shortening of the large Grand Prix triangle, the start and long sides being the same

## Boillot Again Wins French Grand Prix

(Continued from page 97.)

notably by Delage. With a view to decreasing weight and obtaining a better adherence, the differential has been abolished, the chrome nickel steel shaft receiving the crown wheel, and this shaft being carried in ball bearings. In last year's Grand Prix several cars ran without differential with satisfactory results.

Delage has produced a pair of cars having a great similarity with the Peugeot racers. The bore and stroke is 4 by 7.08 inches, the cylinders being a single casting with four valves per cylinder mounted horizontally near the head and operated by two camshafts with vertical rods and bell cranks. This general arrangement of valves was used on the Delage three-liter racers which were so successful in 1910. The crankshaft of the Delage racers is built up and is carried on five ball bearings, the balls having 1 inch diameter. Steel pistons with two rings and I-section connecting rods, all of BND steel, are employed. The Delage engineers took the precaution of fitting two magnetos, both being driven and set exactly alike, but only one being wired. In case of breakdown it is only necessary to change over from one magneto to the other. Claudel supplied the carburetor, which is connected up to the cylinder group by a four-branch piping. Forced-feed lubrication is employed, the pressure being moderate. A gear pump delivers the oil to the main ball bearings, then through oilways in the shaft to the

connecting-rod ends, which are lined with white metal. Castor oil is used for lubricating purposes, and in addition to the supply in the sump there is a reserve quantity in a dashboard tank.

Particular interest attaches to the Italas by reason of the use of the firm's rotary valve motor. This consists of a water-cooled rotary distributor common to two cylinders, and is similar in general design to the distributor used on the firm's touring cars. The cylinder bore is the highest to be found in the race, being 4.9 inches, with a stroke of 6.6 inches. None of the other makers of four-cylinder motors have exceeded 4-inch bore. The cylinders are a pair casting with cylinders carried on five plain bearings. Shaft drive is employed with the use of a torque tube. These cars have not been observed in practice with the others and no opportunity has been afforded of judging their speed ability. They have the disadvantage of being very close to the maximum weight allowance, but by reason of their distinctive valve mechanism will be watched with interest.

Excelsior, like Sunbeam, ran a couple of six-cylinder motors, their dimensions being 3.5 by 6.29 inches. The cylinders are in two castings of the L-type, with valve stems inclined outwards. Schneider has a team of four cars distinctive by reason of the dashboard location of the radiator and the use of thermo-siphon cooling. These were the only cars in the race not making use of a water pump. Cylinder dimensions are 3.77 by 7.48 inches, with valves on one side and stems inclined outwards. Opel has also a four-cylinder, bore and stroke being 3.5 by 6 inches, valves being placed in the head and inclined at 45 deg.

## FEATURES OF CYCLECARS RUNNING IN FRENCH CYCLECAR GRAND PRIX

Machine	Drivers	Motor	Bore and Stroke, Inches	Oiling	Magneto	Carburetor	Transmission	Final Drive	Steering	Tires, Inches
Automobilette..... (France)	Ducruzei..... Simon.....	4-cylinder water cooled	2.3x3.9	Forced feed	Bosch	Longuemare	Chain to countershaft	Double belts	Steel cables and bobbin	26x2½
Bedelia..... (France)	Prevot..... Bourbeau..... Contentet..... Bonville.....	Twin V air-cooled	3.2x3.9	Splash	Ruthardt	Claudel	Direct	Double belts	Steel cables and bobbin	26x2½
Bolton-Precision..... (England)	D. C. Bolton.....	Twin water	3.3x3.7	Splash	Bosch	Senspray	Chain to countershaft	Double belts	Steel cables and bobbin	26x2½
D. E. W..... (England)	W. D. Hawkes.....	Twin Precision water	3.3x3.4	Splash	Bosch	Solex	Chain, 2 speed gear countershaft	Double belts		26x2½
Duo..... (England)	Messervy..... Francis.....	Twin air Twin water	3.3x3.7	Splash	Bosch	Two Sol. x	Chain to countershaft	Double belts	Direct	26 3
Du Guerclin..... (France)	Pessé.....	Four water	2.3x3.9	Splash	Bosch	Claudel	Shaft to countershaft	Double belts	Direct	26 3
G. N..... (England)	Whitehead..... Nash.....	Twin V air	3.3x3.8	Splash	Nilmelior	Solex	Shaft, bevels, chains to countershaft	Double belts	Direct	26 2½
La Roulette..... (France)	Des Salles..... Vigliotti.....	Twin V air	2.9x4.7	Splash	Bosch	Claudel	Chain to countershaft	Double belts	Steel cables and bobbin	26 3
Mathis..... (Germany)	Esser.....	Four water	2.3x3.9	Forced feed	Bosch	Claudel	Clutch, gear-box, shaft	Bevel rear axle	Worm and sector	26 2½
Morgan..... (England)	McMinnies..... N. F. Holder..... H. F. Morgan..... R. G. Mundy.....	Twin water	3.5x3.1	Semi-automatic	Bosch	Amac	Shaft to gear-box	High and low speed chains	Direct	27 3
Marlborough..... (England)	F. H. B. Samuelson.....	Four water	2.3x3.9	Splash	Bosch	Claudel	Clutch, gear-box, shaft	Bevel rear axle	Worm and sector	27 3
Noel..... (France)	L. Noel.....	Twin V air	3.3x3.4	Splash	Bosch	Claudel	Central belt to countershaft	Chain	Steel cable and bobbin	26 2½
Ronteix..... (France)	Jolibois..... Ronteix.....	Four water	2.4x3.1	Splash	Bosch	Ronteix	Shaft to spur gearing on countershaft	Single chain	Mobile eccentric	26 2½
Sphinx-Globe..... (France)	Forster..... Canouel.....	Single air Twin water	4x5.2 3.5x3.1	Splash	Mea Bosch	Zenith Jap	Flat belt to countershaft	Single chain	Direct	26 2½
Super..... (France)	Leveque.....	Twin water	2.9x4.7	Splash	Ruger	Claudel	Cardan to countershaft	Double belts	Steel cables and bobbin	26 2½
Violet-Bogey..... (France)	Violet..... Poulliez..... Antony.....	Twin water	2.8x5.1	Forced feed	U. H.	Gobbi	Friction	Single chain	Rack and pinion	20 2½

NOTE.—In addition to above cyclecars, the following motorcycles with side car attached took part in the race:  
N. S. U.: Pellud; René Gillet; Meriot; B. S. A.: Woodhouse; Regal Green; Touchet; Clyno; Frank Smith; Zenith; Barnes; Zenith; R. Darmont; René Gillet; Vanella.

# Indiana Tourists Reach Grand Junction

**G**RAND JUNCTION, COL., July 15—*Special Telegram*—With 1,800 miles of their 3,600-mile transcontinental journey completed eighteen cars in the Indiana Automobile Manufacturers Association's tour from Indianapolis to the Pacific coast checked in tonight in good order. The only car yet to be heard from is the Brown truck. Like the Premier truck, this truck with its internal-gear drive has been the life-saver of the tour. J. Hollaway, its driver playing the Good Samaritan for all the local cars that got into difficulties in climbing the steep grades over the Rockies. In assisting one of the local escorts over a 25 per cent. grade just west of State Bridge Holloway stripped his low gear yesterday. He hopes to get to Rifle on second and high, where a new gear awaits him and will catch up with the tour later. Following the Midland Trail out of Denver Sunday morning the tourists commenced the long climb over the Rockies even before leaving the city.



Shoving car up-hill on clay road near Jonesburg, Mo.

At its outskirts Inspiration Point was passed, one of the show places of the city, giving a view of 3 miles of mountains. To Golden, 14 miles out, an excellent hard gravel road, good in any weather, was found. From Golden the grade climbed a winding road known as the Hogback up Mt. Vernon Canyon. The road is sandstone and good, although the grades are steep and the road as a rule very narrow. By the time the cars had reached the top of Floyd Hill, 30 miles out, the grade, combined with the altitude had the radiators boiling, although the Motometers showed a temperature of only 18 deg. in the cooling water. The rarefied air was beginning to affect the power of the motors and air adjustments had to be altered. The road down Floyd Hill is a fine example of road building and the grade has been cut to 6 or 7 per cent. by numerous switchbacks. The sharp turns are well marked with sign boards, and at the most dangerous and steep sides, guarded with heavy cables. From the bottom of the hill the motorists followed a winding road through Clear Creek Canyon to Idaho Springs, the luncheon stop. As usual the tourists were greeted with a brass band and enthusiastic reception. Governor Ammons of Colorado, who accompanies the tour to Grand Junction, and C. A. Bookwalter responded to the welcome of the mayor. Idaho Springs claims the honor of being located on the site of the first discovery of gold in the Rockies in 1859. Also its medicinal springs have given it the name of the Carlsbad of Colorado. For 15 miles the road climbs and winds along the river past Dumont, Law-

son and Empire, all mining towns. The latter was one of the most booming of mining camps but the exhaustion of the gold and silver ore has left it practically deserted. At Empire begins the real climb over the continental divide through Berthoud Pass. The tourists now had before them a steady climb of over 4 miles in which they went 3,000 feet vertically. The last 1,000-foot change in altitude was covered in a mile. Some of the grades were as high as 20 per cent. and the altitude affected the power of the motors very materially. The rarefied air did not contain sufficient oxygen to thoroughly burn the gasoline so that the mixture was too rich to give more than a fraction of the power attained at lower altitudes. Most of the cars had difficulty in getting over without unloading passengers and some of them had to be assisted by the latter. In most cases this occurred when a car ahead stuck so that those behind had to stop on a grade. One clever driver, winner of a previous Glidden tour, by careful maneuvering got his car turned around and climbed the pass on reverse, a thrilling feat as the pass was sufficiently dangerous going forward. At the top of Berthoud Pass the tourists were above the timber line and in the realm of perpetual snow. The top of the pass is over 11,000 feet above sea level and the view of the Rockies from the flat table on top is wonderful. The ride down the pass demonstrated the staunchness of the cars as well as did the climb. Sharp turns, steep grades with a cliff on one side and a drop of thousands of feet on the other, the road a mere shelf just wide enough for one car with turnouts at intervals and an excellent road bed marked the roadway itself. All that was needed was a steady hand at the wheel and good brakes. After negotiating the pass the motorists entered the valley of the Grand River which they were to follow in a general way clear to Grand Junction. This led them to Hot Sulphur Springs, 100 miles from Denver. Sulphur water flows out of the ground at a temperature of about 100 deg. and the feature of the town is the hot sulphur baths which have great medicinal properties. This was the night stop. Monday's run was from Hot Sulphur Springs to Glenwood Springs, a distance of 107 miles. The ride was through canyons practically all the way with typical canyon roads and steep grades, but good roadbed most of the distance. A great deal of the road was entirely new where miles and miles of road were blasted out of the rock to lessen the grade. Road crews were at work. The feature of the day's trip was the run through Gore Canyon which globe trotters claimed nothing in the Alps could surpass. Like



Some of the Indiana-to-Pacific cars in Warrenton, Mo.

Hot Sulphur Springs, Glenwood Springs is famed for its natural heat baths, the great open air natatorium being the chief feature. Today's trip was about 110 miles and offered the greatest contrast in country of any 1 day so far. The tourists started out through the Canyon of the Grand with the typical eyelash roads, passed convicts at work on the roads, traversed veritable desert country where no sign of animal life could be seen except coyotes and gophers with the painted cliffs all around showing every color of the rainbow and the glistening white from the alkali deposits. Then when the tourists began to talk about the Inferno they ran into Palisades and the heart of one of the greatest fruit countries in the world. From Palisades to Grand Junction the route was a boulevard lined on either side with orchards. Pathfinder running under sealed bonnet with W. O. L. Westgard, appointed official observer for A. A. A., broke its bonnet seals 40 miles out of Denver on account of the short circuiting of distributor carbon from brushes, having covered 1,584 miles, a fine record.

DENVER, Col., July 11—When the sixty-five dust-covered motorists on the tour from Indianapolis to the Pacific Coast pulled into Denver this afternoon, the nineteen Indiana-made cars that carried them had covered 1,475 miles of their journey to Los Angeles, and had blazed the trail to this point for the Lincoln highway, the cement boulevard across the continent for which Carl Fisher and others on the run are working so hard. After a day's rest in the mile-high city, the tourists will leave on Sunday morning on the next leg of their journey over the Midland trail for Hot Sulphur Springs.

Leaving Kansas City on July 7 after the first week of touring, the Hoosier motorists camped at night at Junction City. The original intention was to lunch at Fort Riley, the military station 3 miles away, but it was found that though they were free to camp there military regulations prevented the government selling supplies to them; so that in order to get something to eat it was necessary to make camp at Junction City. However, the soldiers entertained the tourists during lunch by a concert of the regimental band. Here the tourists indulged in some horseplay by staging a "badger fight," of which C. A. Branston, the English motor car engineer accompanying the tour, was the victim. He was unanimously elected over Carl Fisher and former mayor of Indianapolis Bookwalter as the one worthy of the honor of holding the "badger." The Britisher had become sufficiently Yankeeized to appreciate the joke and enjoyed the spoofing as much as the others.

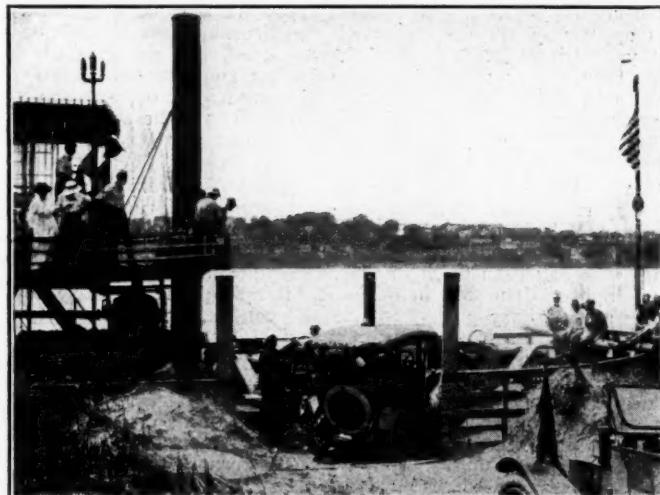
The next day's run was through Abeline and Salina, Ellsworth and Hays to Ellis. At Ellsworth, the noon stop, the tourists had their first taste of entertainment at a private residence, the home of Col. J. B. Wellington being thrown open to them and the luncheon served by the ladies of the town, assisted by the local Chamber of Commerce. Meanwhile the local band

entertained with a repertoire which, much to the delight of the Hoosiers, consisted chiefly of "On the Banks of the Wabash." As Kansas is a dry state, the governor was locked in an upstairs room while refreshments were served in the basement by Col. Wellington, who, by the way, is president of the Golden Belt route.

At Hays the local paper got out a special edition on the tour, copies of which were presented to the Hoosiers 5 miles out of town. At Ellis, Kan., a town of 5,000 people, the tourists had their first taste of real camping. The tents which each car carried were pitched in the city park, and during the night a terrific storm struck them.

Burlington, Col., formed the next night's stop. Before reaching town the tourists were met by a band of forty yelling cowboys, their first equine escort. They also were met by a party from Denver representing the Midland trail and headed by J. O. Boak, the man who came from Denver to Indianapolis in the spring and induced the officials of the tour to include the Midland trail in their itinerary. The delegation led the way to the fair grounds and then gave an exhibition of cowboy races and broncho busting that opened the eyes of the tourists. The latter reciprocated by a parade around the half-mile track.

From Burlington the Hoosiers proceeded the next day to

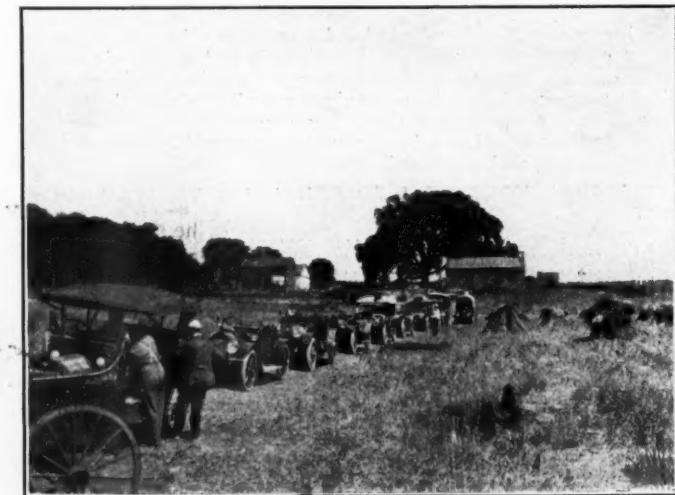


The cars crossing the ferry from Howard, Mo., to Booneville, Mo.

Colorado Springs, halting for lunch at Limon. At Colorado Springs they were overwhelmed with entertainment and had to neglect much that had been arranged. The festivities started with a banquet that lasted all evening and at which great enthusiasm was shown for both the tour as a tour and the Lincoln highway. The next day a trip was made to the Garden of the Gods, to Crystal Park and Ute Pass. Manitou Springs were visited and a trip made up Pike's Peak. The run up Ute Pass was made in local cars with the exception of Harroun and his party, who drove the Henderson, which has come all the way on kerosene. The pass is said to be 11,000 feet in altitude, and Harroun finds that his kerosene carburetor with which the Henderson he is driving is equipped gives even better results from coal oil in the higher altitudes than in the lower ones. This, he believes, is due to lower vaporization point of the fuel on account of the decreased atmospheric pressure.

From Colorado Springs the run was made to Denver this afternoon under the guidance of pilots from the Denver Chamber of Commerce and the Denver Motor Club and the Colorado Automobile Club. At the steps of the capitol building Governor Ammons presented state and national flags and expressed his intention of accompanying the tour to the Utah line.

Sunday, the motorists leave for the 91-mile trip to Hot Sulphur Springs, following the Midland trail and crossing the continental divide over Berthoud Pass, nearly 12,000 feet above sea level.



Cars waiting to cross ferry from Howard, Mo., to Booneville, Mo.

# Few Scores Marred in Early Glidden Days

**Tourists Enjoy Run in Picturesque West—Unprecedented Comfort**

**M**INOT, N. D., July 15—*Special Telegram*—With the fourth day of the Minneapolis to Glacier A. A. A. tour ended the tourists are satisfied to date. Only one entry has been withdrawn, the No. 19 Chalmers and the owner regrets the move already. A Ford and a Chalmers entered here as non-contestants. Fifteen points were charged against No. 11 Kisselkar for running through special control at Crookston. Forty-seven points against No. 3 Stutz is for being 50 minutes late at noon control today. The Stutz broke both front springs in the morning and afternoon. Metz No. 7 broke a wheel on a short turn 31 miles out and replaced it with a spare wheel in a short time. Chevrolet, a non-contestant, broke a cone on a front bearing. Driver continued to the noon control, returned on freight train with new cone and is on his way. Today's run was fine, weather was hot and at times sand was terrific but not impassable. Referee Dutton will suggest to Contest Board that fourth-grade rules be amended to check cars at city limits or distant from control so as not to confuse those working on their cars and apparently arrived on time. By directing repairs at least 300 yards from control at checkers' stand, the work will be done before they are checked in and on running time. With No. 1 car, now a non-contestant, ten entered machines still have a perfect score to run against for the rest of the week.

#### Good Roads on Third Day

**G**RAND FORKS, N. D., July 14—*Special Telegram*—Half of today's run in the ninth national reliability run, Minneapolis to Glacier Park, was over soft, recently wet gumbo roads. The second half was mainly over gumbo and gravel roads that had been dried in the parching wind blown since the rain stopped. The Mitchell Moose pilot dropped out early to repair an auxiliary gas pump and the confetti was transferred to the Paige-Detroit press car. On arrival here the Mitchell was found to have a bent and slightly cracked steering knuckle and a broken pedal. All these, with several broken windshield holders and the broken frame of No. 3 Stutz, were repaired in a few minutes each by the Vulcan process outfit on the train. One Metz car broke a front spring. Many stops were recorded for the morning run for water. The afternoon schedule was cut to 16, 14 and 12 miles an hour in expectation of trouble, but the running was the best yet. A boiling radiator in the Mitchell six pacemaker made a delay and the flag was transferred to Marmon entry No. 2. Dr. E. W. Humphreys, Morehead, Minn., added a Velie tourabout as No. 17 entry early today and will go through, and a Luverne touring car fell in line as escort through North Dakota. President Enos and Batchelder took a position in line behind the pacemaker today. They are entranced with the North Dakota scenery and prospects of motoring over slightly rolling plains for the next 6 days. It has been discovered in this tour that roads are perfect in dry weather but slippery after rains for 24 hours. Roads are well posted by trail associations thus far.

#### Hard Going in First Stretch

**F**ARGO, N. D., July 12—Strenuous in the extreme was the first leg of the ninth national reliability run of the American Automobile Association ending tonight. Until Monday the tourists will enjoy a much-needed rest aboard the Great Northern hotel train. The tour began at 8:30 a. m. from the Automobile Club of Minneapolis July 11. It will end Saturday afternoon, July 19, at Glacier Park station, Mont. Beginning in a hard rain, the morning run to St. Cloud was a slipping, slewing, sliding event testing the nerve of pilots and trying the twenty-six cars in line to a finish. The roads were soft and slimy the first half day and as bad in the afternoon up to the night stop at Alexandria. At noon the time was lowered 2 miles an hour, and the reduced schedule was maintained today. The morning run was in a hard rain to Fergus Falls, but in the afternoon a west wind sprang up and with the combination of gravelly soil the first enjoyable stretch was enjoyed. A newly made road across deep cuts resulted in ditching the Mitchell Moose pathfinder twice, a Little car, a Premier entry from Galesburg today, and in numerous carburetor and magneto troubles from water. The Kisselkar entry broke a front spring leaf today and the Paige press car was a close second with similar injury. A. G. Batch-

elder, riding in the president's car with Laurens Enos of Buffalo in a five-passenger Winton, was thrown suddenly against a top rib and made unconscious for several minutes. Similar accidents were common.

The first 2 days was a remarkable test of pilots. Notwithstanding the road trials, which varied constantly with the character of the soil, plowing against pelting rain and required to watch against slipping from the road, which in long stretches was little wider than the car treads with ditches on both sides, accidents were rare.

Many veteran drivers are in the tour and several foreign entrants, including C. H. Metz and C. Walter Metz of Waltham, Mass., makers of the Metz cars, and G. H. Voter of Boston, entrant of a third Metz to make the Boston team. These are the only friction drive cars in the run. The tendency in this tour for short wheelbase cars, including runabouts and four and five-passenger touring cars, has proved satisfactory, as they have held the roads better and are in less danger in wet weather on the Minnesota road traveled in the annual tour than the heavier touring cars.

The ninth annual reliability run to date has been for the first 2 days called a voyage by the contestants. Referee C. E. Dutton, who is also chairman of the touring board, suggested decoy ducks instead of confetti. The best result, aside from showing the integrity of the cars taking part as entrants, official machines and non-contesting, has been to demonstrate the fallacy of the common idea of road building in the state up to the present time and to show the value of good road making in counties that have evinced scientific interest in their road work. The tour is already pointing out to the people along the route, which thus far is the northern official transcontinental route of A. L. Westgard, the necessity for further improving roads so as to attract the touring public. Great improvement over the routes as they have been toured in former state and city automobile runs is shown to the veterans. Another expectation is that the entry of three runabout teams and several individual entries in the same class will advertise the fact that the manufacturers on the inside are playing strong to popularize this type of car as most feasible for the general country citizen's use.

The feature of the present tour, aside from the attendance of two executive officers of the A. A. A. and the presence as passengers of C. C. Lake, sales manager for the Premier company, and Frank Mooney, publicity manager for the Hupp Motor Car Co., is the hotel train of twelve Great Northern cars, including dynamo, welding and newspaper, engraving and photograph car, and the perfect array of sleeping, observation and dining cars. Formality is barred. When the tourists reach a control they go immediately to the dining cars for their luncheon. At night the performance is repeated for dinner and the night's rest. The train, carrying passengers who drop out of the cars for a day or half day, reaches the stations first. The controls are at the stations and the referee has no trouble in keeping track of everybody, because the hotel train is headquarters at all times. Every night a copy of the *Glacier Park Blazer* is laid at the plates in the dining car. It contains the photographs and news of the day. It is set up, printed and the engravings are all made on the train.

Penalties for the first 2 days, for minutes late only, under fourth grade rules, have been announced partially tonight by Referee Dutton, and are as follows:

NATIONAL TOUR REVISED PENALTIES TO JULY 13				
No.	Car	1st Day	2d Day	Total
4	Premier	5	0	5
8	Krit	8	0	8
9	Krit	70	0	70
11	Kissel	5	0	5
16	Little	87	19	106
18	Locomobile	360	0	360
19	Chalmers	57	0	57
21	Maxwell	55	24	79
22	Velie	4	16	20

**S**T. LOUIS, Mo., July 14—All arrangements for the run of business men and manufacturers from Vincennes, Ind., to East St. Louis, Ill., are completed. The purpose of the trip is to urge the necessity of making the state trail a hard road and about seventy cars will make the trip. Thirty cars will leave the Indiana city and at Salem, Ill., twenty-five other cars will join the Hoosier contingent, with the tour picking up about twenty cars en route. Twenty cars will leave East St. Louis for Carlyle, Ill., on July 16 to meet the westward-bound Indians and attend the good roads meeting.

# C. M. C. To Have First U. S. Cyclecar Run

## Small Car Division for Club's Reliability Contest—Electric Meet

CHICAGO, ILL., July 15—*Special Telegram*—The first cyclecar competition ever held in America is scheduled for this fall when the diminutive vehicles will form a division in the Chicago Motor Club's second annual Around Lake Michigan Reliability Contest provided there are enough makers of the new type of cars to insure sufficient entries. The competing cars probably will be limited to a cylinder capacity of 67 cubic inches and their stripped weight must not exceed 672 pounds. The entry fee will be \$15 and a special trophy will be offered. Penalties will be for time and work.

### Maryland vs. D. C. Dispute Ends

WASHINGTON, D. C., July 15—*Special Telegram*—The end of the long automobile war waged between the District of Columbia and Maryland and lately taken up by the State of Virginia is in sight as the result of a decision reached today by the commissioners to rescind the order adopted by them last January compelling motorists from other states who use District roads to pay the same amounts for licenses as are assessed against Washington automobilists who enter those commonwealths.

Formal action revoking the order may be taken by the commissioners tomorrow. While the object of the regulation was to establish reciprocity in license fees, the District heads are convinced that it has worked a hardship upon Maryland and Virginia citizens and therefore believe it should be annulled.

It is believed that the return to the former license arrangement under which a perpetual District license may be obtained upon the payment of \$2 will result in establishing harmony between the District of Columbia, Maryland and Virginia in the matter of regulating motor vehicle traffic and put an end to any discriminatory practices which may be exercised by the authorities of those states against Washington motorists.

The commissioners have assurances from Maryland and Virginia motorists that they will use their influence with their respective legislatures in obtaining the enactment of a law which will not impose a burden on District residents.

### Big Electric Convention October 27-28

NEW YORK CITY, July 15—The Electric Vehicle Association will hold no meetings in New York during July and August, but there is a possibility of one being held in September. Unless the latter takes place, the next big event will be the fourth annual national convention, which will be held in Chicago on October 27 and 28. While the plans for this event have not been worked out as yet, the convention committee is busy preparing all the necessary details for the enterprise. It is composed of the following members of the association: Directors—W. P. Kennedy, W. G. Bee, James T. Hutchings, Louis A. Ferguson, W. W. Freeman, F. M. Tait, Hayden Eames, Charles Blizzard, W. H. Blood, Jr., E. S. Mansfield, G. H. Kelly and P. D. Wagoner. Homer E. Niefz, of the Cosmopolitan Electric Co., Chicago, is chairman of the committee. Included are also the following Chicago members: J. F. Gilchrist, Geo. H. Jones, E. W. Lloyd, J. H. Atkin, E. E. Witherbee, William L. Ruud, Uri Grannif, L. E. Wagner, B. C. Arlington, L. E. Burr, C. B. Frayer, P. H. Schaffner and W. D. McDower.

### Safety Exposition in December

NEW YORK CITY, July 16—The American Museum of Safety will hold here the First International Exposition of Safety and Sanitation in America, between December 11 and 20. It will include exhibits relating in any way to safety, health, sanitation, accident prevention, welfare, etc. European exhibits for the exposition will be admitted free of duty, by special act of Congress.

### Cleveland Midsummer Show

CLEVELAND, O., July 12—The midsummer automobile show to be held in connection with the Forest City Fair in August will appeal particularly to farmers, as arrangements are being made by the show promoters to provide especially large accommoda-

tions for demonstrators with machines adaptable to farm uses. As roads will be in much better condition than in winter, when Cleveland's annual show is held, it is expected farmers will attend the midsummer exhibition in large numbers and that they will easily be interested in farm motor appliances.

ALLEGHENY, PA., July 14—The creditors of the Webb Co., maker of fire equipment, resolved to ask a receiver for the company, as it has not enough money to buy materials for manufacturing operations, although orders on hand aggregate \$373,000.

AUSTIN, TEX., July 14—It is claimed by Attorney-General B. F. Looney that gasoline is being sold in Texas at a profit of nearly 200 per cent. He says that the testimony and evidence in the suit of the State of Texas against the Magnolia Petroleum Co. and other alleged subsidiaries of the Standard Oil Co., in which penalties aggregating \$102,000,000 for alleged violations of the anti-trust law are sought to be recovered, show the price of gasoline is abnormally high in this state and all over the country. Since this suit was filed the price of gasoline in Texas has dropped from 20 to 18 cents per gallon.

### Truck Club Discusses Drivers

NEW YORK CITY, July 16—At the monthly meeting of the Motor Truck Club, held at the Hotel Cumberland this evening, the subject of drivers was the topic of discussion. George H. Pride, of the Heavy Haulage Co., of New York, spoke from his extensive experience in managing the operation of a large fleet of trucks and was followed by Alfred Aram of the Auto Efficiency Engineering Co., who has given the subject considerable study. Discussion followed in which several authorities expressed opinions.

Progress with the membership campaign which the club is conducted was favorably reported and plans for an outing in the form of a clam bake were discussed. The meeting was attended unusually well.

NEW YORK CITY, July 14—The arrival in Gotham of the Chevrolet Motor Co., with a large factory on Eleventh avenue and Fifty-seventh street, salesrooms at 1651 Broadway, New York, and one at 1505 Bedford avenue, Brooklyn, means that W. C. Durant, its organizer, has re-entered the field of his former activities.

The Chevrolet Motor Co. has an authorized capital of \$2,500,000. Its main factories are located at Flint, Mich., where all parts of the Chevrolet cars, from the bodies to motors, wheels, axles and accessories, are manufactured. The branch factory in New York occupying 125,000 square feet in space is equipped for the special manufacture of the company's \$1,250 model and will be ready for the production of these cars August 1.

The following models are shown at both branches:  
Chevrolet H-2 Royal Mail, four-cylinder, two-passenger roadster, \$750.  
Chevrolet H-4 Baby Grand, four-cylinder, four-passenger touring, \$875.  
Chevrolet Special, with electric lighting and starting, five-passenger, \$1,250.

Chevrolet L, six-cylinder, electric lighting and starting, \$1,450.  
Chevrolet C Classic, big five-passenger, \$2,500.  
All the four-cylinder cars are equipped with the new overhead valve motors designed by Arthur Mason and made by the Mason Motor Co.

LANSING, MICH., July 14—The Reo Motor Car Co. has put its stock on a 10 per cent. annual dividend basis, with quarterly payments of interest.

NEW YORK CITY, July 14—The regular quarterly dividend of 1½ per cent. will be paid on Willys-Overland Co. common stock on August 1, to the stockholders on record on July 19.

INDIANAPOLIS, IND., July 14—The appointment of Philip Ragan as manager of the Rauch & Lang Auto Co., Indianapolis, has been announced. Mr. Ragan has been identified with the motor interests of Cleveland for some years.

INDIANAPOLIS, IND., July 14—The retail business of the Indianapolis branch of the Studebaker Corporation has been taken over by the Brown-Rowan-Buck Auto Sales Co., a \$40,000 concern formed by Detroit men. There is to be no change in the wholesale distributing business of the branch, which will still be under the management of R. L. Sutherland. The change in the retail end of the business will give Mr. Sutherland an opportunity to devote his attention exclusively to building up the Studebaker sales organization in Indiana and adjacent states.

KENOSHA, WIS., July 12—Forty-eight employees of the Jeffrey organization, whose terms of service with the company aggregate 887 years, made up a party of old-time bicycle men and pioneers in the manufacture of automobiles, which was banqueted in Kenosha, Wisconsin, the other night.

CLEVELAND, O., July 12—The sale of fifteen motor trucks to the Stern Bros. Dry Goods Co., of New York, was announced recently by the White Co., of Cleveland. Two White trucks were bought some time ago by Stern Bros. when they began experimenting with motor vehicles.

# \$23,821,782 of Exports

**During 11 Months, Ending With May, Car Exports Rose \$4,000,000 Above 1 Year Before—Record Cyclecar Output Planned**

WASHINGTON, D. C., July 12—Detailed figures on motor car exports for the month of May and for the 11 months' period ending May, together with figures for comparative periods, were announced today by the federal bureau of statistics. As previously reported in THE AUTOMOBILE, the car exports in May last numbered 3,036 machines, valued at \$3,155,189, as against 3,009 cars, valued at \$2,963,818, exported in May a year ago. During the 11 months' period the exports increased from 19,816 cars, valued at \$19,433,965, in 1912, to 23,132 cars, valued at \$23,821,782, in 1913.

Canada continues to be the largest purchaser of American-made cars, 862 machines, valued at \$1,255,771, having been shipped to that country in May. However, this is a distinct drop from Canada's purchases in May 1 year ago, when 1,109 cars, valued at \$1,352,856, were shipped there from the United States. During the 11 months' period, however, the exports increased from 5,533 cars, valued at \$6,534,088, in 1912, to 6,829 cars, valued at \$8,636,880, in 1913.

The detailed shipments to other countries for the periods under consideration were as follows:

Country	May, 1912		May, 1913	
	Number	Value	Number	Value
France	63	\$48,980	108	\$72,149
Germany	49	36,719	192	145,799
Italy	30	35,605	5	12,500
United Kingdom	673	465,722	473	354,686
Other Europe	204	155,125	294	236,447
Canada	1,109	1,352,856	862	1,255,771
Mexico	8	15,370	6	5,110
West Indies and Bermuda	29	36,237	45	47,591
South America	162	183,292	213	248,707
British Oceania	445	412,565	234	220,372
Asia and other Oceania	152	149,309	282	272,174
Other countries	85	283,883	322	283,883
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Country	11 Mos., 1912		11 Mos., 1913	
	Number	Value	Number	Value
France	507	\$419,816	753	\$571,049
Germany	261	190,440	692	632,247
Italy	169	157,852	276	247,863
United Kingdom	5,389	4,231,487	3,593	2,737,438
Other Europe	1,062	870,311	1,601	1,368,654
Canada	5,533	6,534,088	6,829	8,636,880
Mexico	266	410,129	265	496,981
West Indies and Bermuda	299	318,618	415	430,106
South America	1,444	1,736,921	2,651	2,978,020
British Oceania	3,479	3,137,612	2,744	2,582,239
Asia and other Oceania	1,001	1,038,677	2,025	1,944,287
Other countries	406	388,014	1,288	1,196,018

Imports of cars continue to show big decreases. The number imported in May, 1912, was 76, valued at \$165,759, decreasing to 42 in May last, the value of which was \$113,737. The imports for the 11 months' period decreased from 921, valued at \$2,033,254, in 1912, to 704, valued at \$1,653,864, in 1913.

The imports by countries were as follows: France, May, 1912, 41, valued at \$95,965; May, 1913, 17, valued at \$49,515; 11 months, 1912, 380, valued at \$914,529; 1913, 337, valued at \$799,099.

Germany, May, 1912, 5, valued at \$10,114; May, 1913, 8, valued at \$21,154; 11 months, 1912, 113, valued at \$250,507; 1913, 90, valued at \$235,526.

Italy, May, 1912, 11, value, \$17,424; May, 1913, 9, value, \$23,615; 11 months, 1912, 126, value, \$189,130; 1913, 112, value, \$198,782.

United Kingdom, May, 1912, 11, value, \$28,324; May, 1913, 3, value, \$6,300; 11 months, 1912, 181, value, \$417,506; 1913, 77, value, \$216,632.

Other countries, May, 1912, 8, value, \$13,932; May, 1913, 5, value, \$13,153; 11 months, 1912, 121, value, \$261,582; 1913, 88, value, \$203,825.

### Peabody Sold to Allen Concern

FOSTORIA, O., July 14—A deed was filed recently conveying from the Peabody Buggy Co. to the Allen Motor Co. the plant of the former, which will be used to make the new Allen automobiles. The consideration as stated in the deed was \$150,000 of the capital stock of the new corporation.

### Brisco Car Building in France

PARIS, July 9—Some of the secrecy which has surrounded the Briscoe car being built in Europe has now been removed by the appearance of the first models on the road. Last January, Mr. Benjamin Briscoe registered the Compagnie Briscoe Frères under the French laws and began work on the production of a light car for the American and European market. It was then announced that it was Mr. Briscoe's intention to combine in this new car all the best features to be found in France and America.

Although the design of the new Briscoe car does not present any startling departure from standard practice, it embodies all the latest ideas of the French school, and has been laid out with a view to the most economical production on American quantity lines. So far as design is concerned, it is the embodiment of the latest European practice. The motor is a four-cylinder, block, long-stroke type, its dimensions being 3.25-inch bore and 5.2-inch stroke. On bench tests it is declared to have developed 33 horsepower at 1,600 revolutions. The motor is an L-casting with enclosed valves, integral intake manifold and independent exhaust manifold. It is silent in operation and has a neat, clean-cut appearance. In accordance with the tendency shown at the last European shows, and strengthened during the present season, the motor and gearbox form a unit, the gears providing three speeds ahead and reverse. The rear axle is of the floating type and wire wheels are fitted.

In external appearance the car has the features of the highest grade European productions. The bonnet merges gracefully into the scuttle dash carrying the gasoline tank and the fore and aft line of the car as unbroken, while all harshness is removed by carefully rounding off angles.

### Downing Plans To Make 30,000 Cyclecars

CLEVELAND, O., July 12—Cleveland is to have a large cyclecar factory, according to announcement made by the Downing-Detroit Motor Car Co., which is seeking a site for a plant to turn out 30,000 Downing cyclecars for the 1914 season. Negotiations for a site have been in progress some time, but it was said today a deal had been completed. The location of the site was not given out.

The model for 1914 is a 12-horsepower machine weighing 800 pounds. The Downing car is of the roadster type and carries two passengers.

### Fine Crops Reported in Ohio

COLUMBUS, O., July 14—The official crop report of the Ohio State Board of Agriculture, issued July 10, shows that the crop conditions in the Buckeye state are the best in years. The wheat crop is estimated at 94 per cent. and the growing corn crop at 95 per cent. The other crops show up almost as well. This is taken as an indication of better buying of automobiles in the rural sections of the state.

ROCK HILL, S. C., July 12—John G. Anderson, owner of the Rock Hill Buggy Co.'s manufacturing plant, has completed his plans to enter extensively into the making of automobiles.

### Automobile Securities Quotations

The stock market, so far as automobile securities were concerned, broke all along the line this week, rather in response to the generally disturbing news. All stocks which changed their quotations did so in a downward manner, and changes varied from 15 points to fractions.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Company, common	120	145	160	160
Ajax-Grieb Rubber Company, preferred	100	94	100	100
Aluminum Castings, preferred	100	97	100	100
American Locomotive Company, common	41	41 1/2	27 1/4	30
American Locomotive Co., preferred	108	108 3/4	100	102
Chalmers Motor Company, common	..	110	116	116
Chalmers Motor Company, preferred	..	98	102	102
Consolidated Rubber Tire Company, common	13 1/2	15	14	17
Consolidated Rubber Tire Company, preferred	50	59	60	75
Firestone Tire & Rubber Company, common	285	293	270	280
Firestone Tire & Rubber Company, preferred	105	107	103	105
Fish Rubber Company, common	..	..	100	100
Fish Rubber Company, preferred	..	..	..	100
Garford Company, preferred	99	101	85	95
General Motors Company, common	31	33	27 3/4	30 1/4
General Motors Company, preferred	75	76	73 1/4	77
B. F. Goodrich Company, common	76 1/4	77 1/2	27 1/2	29
B. F. Goodrich Company, preferred	109	109 1/2	90 3/4	92 3/4
Goodyear Tire & Rubber Company, common	315	320	330	337
Goodyear Tire & Rubber Company, preferred	103	104	98 1/2	100
Hayes Manufacturing Company	97	..	..	90
International Motor Company, common	23	25	3	5
International Motor Company, preferred	83	85	18	25
Lozier Motor Company, preferred	..	..	15	20
Lozier Motor Company, preferred	..	..	..	90
Maxwell Motor Company, common	..	..	2 3/4	3 1/4
Maxwell Motor Company, 1st preferred	..	..	24	26
Maxwell Motor Company, 2d preferred	..	..	6	8
Miller Rubber Company	145	150	133	137
Packard Motor Company	104 1/2	106 1/2	98	101
Peerless Motor Company, common	..	..	45	50
Peerless Motor Company, preferred	..	..	..	96
Pope Manufacturing Company, common	30	31	7	10
Pope Manufacturing Company, preferred	73	74 1/2	27	33
Portage Rubber Company, common	..	..	..	90
Portage Rubber Company, preferred	..	..	..	90
Reo Motor Truck Company	8 1/4	9 1/4	10	11 1/2
Reo Motor Car Company	19	20	19	21
Rubber Goods Manufacturing Company, preferred	..	..	100	110
Studebaker Company, common	29 3/4	31	22 1/2	24 3/4
Studebaker Company, preferred	94	94 1/2	82	87
Swinehart Tire Company	98	100	85	88
U. S. Rubber Company, common	..	..	59 1/2	60
U. S. Rubber Co., 1st preferred	107 1/2	108 1/2	104	105
Willys-Overland Company, common	..	..	57 1/2	62
Willys-Overland Company, preferred	..	..	85	90

## Burrowes Talks on Steel

Tells S. A. E. in Detroit of Difficulties in Finding Steel of Proper Magnetics—Delco Files Starter Suit

DETROIT, MICH., July 12—The Detroit Section of the Society of Automobile Engineers at its monthly meeting held on July 10 listened to some authoritative talk on the Correlation of the Physical and Magnetic Properties of Steel by Charles W. Burrowes, who has charge of the Magnetic Section of the United States Bureau of Standards at Washington.

For the past six or seven years Mr. Burrowes has been investigating this relation of properties with the aim of devising methods of testing specimens of iron and steel magnetically and to thus fix the hardness, tensile strength, etc., without damaging the specimen in any way. Physical tests render the test piece useless.

Speaking of his experiences in this field, he stated that his first difficulty was in finding two pieces of steel of the same magnetic characteristics, so widely varying are the properties of steels which are supposed to have exactly the same composition. The possibilities of such a method of testing for flaws in steels are many. Since magnetic testing does no damage, each piece coming to the factory might undergo test, and the present uncertainty that a shipment is all of the same grade and strength would be eliminated, for under present methods it is impracticable to test more than several specimens selected at random from the lot and then to assume that the balance conform to the same characteristics. However, such accurate testing of each piece would only be feasible for high-grade material.

In going about his work, Mr. Burrowes has sought for the relation between the magnetic variations and the differences in mechanical inhomogeneities. However, if this magnetic means of testing is going to be helpful in detecting weak points, much experimenting on hundreds of specimens will be necessary. The idea is about as advanced as was the science of chemistry hundreds of years ago.

Steel which has been quenched at different temperatures shows up very differently mechanically, and it has been found that quite frequently magnetic softness and mechanical softness go together.

A number of interesting curves were shown to aid in making clear the relation of magnetic properties and physical ones. Annealed and hardened steels have very different hysteresis curves, while there was also much variation in the normal induction curves for spring steel after various heat treatments.

Evidently there are certain definite laws relating the magnetic and physical properties of iron and steel. Curves were shown which indicated that as the magnetic induction gets greater, the greater the tensile strength up to a certain point, after which the relation changes. The relation between the Brinnell hardness of specimens and the magnetic induction was also shown graphically, while the effects of special heat treatments on 1 per cent. and 0.8 per cent. carbon steels brought certain definite variations in the magnetic properties.

At any rate, said Mr. Burrowes, if it is possible to separate properly from improperly heat-treated steels by this magnetic method, we have gone a long way in the work.

The present patent crisis and its effect upon the automobile engineer was also discussed, the consideration of this topic being opened by E. J. Stoddard, who stated that a crisis was imminent due to the flood of patent bills being introduced into Congress. There has been more or less dissatisfaction with the administration of patent law, largely arising through the inaptness of the judges in deciding mechanical and engineering questions.

### Oldfield Patent Bill Denounced

It is a question, according to Mr. Stoddard, whether the European method of using experts as judges is practicable. The engineering fraternity favors such a course, while the lawyers are opposed to it. The Oldfield bill now before Congress is something that has aimed to get at the evil, though it is evident that many of its measures have been prepared hastily and without proper consideration. Mr. Stoddard stated that this Oldfield bill is wrong in its spirit. It indicates a retrograde movement on our part and instead of leading the world in patents we would soon be far behind with such a bill as this as law to rob inventors of any recompense for their inventions.

Milton Tibbets also spoke against the bill, stating that the mechanical and electrical engineering associations have passed

resolutions against the Oldfield measure similar in their import to those passed by the Society of Automobile Engineers at its recent summer convention. In fact, engineers all over the country are working against the bill. The mining and civil engineering bodies will take action against it at their next meetings.

engineering bodies will take action against it at their next meetings. Mr. Tibbets predicted concerted action against the bill by all engineers this fall, and inasmuch as it is likely to make patents of little use to anyone, he suggested that all engineers investigate it so as to understand its import and be able to strenuously work against it this fall and winter, and aid in proposing useful legislation to take its place.

Otto Barther stated that the present patent law is comparatively satisfactory and sees no reason for change. However, the patent law at present is decidedly unsettled, due to the many conflicting decisions rendered. There should be some settlement of the law.

### Delco Suit to Protect Huber Patent

NEW YORK CITY, July 15—The Dayton Engineering Laboratories Co., Dayton, O., has filed suit against the Sidney B. Bowman Auto Co., of this city, for alleged infringement of the patents Nos. 745,157 and 842,827, property of the Delco concern and Conrad Huber, and covering the starting and lighting system made by the Dayton company. The suit will not come up before October, when the U. S. District Court, Southern District of New York, will reopen for work.

MILWAUKEE, Wis., July 14—The Milwaukee Motor Co., Milwaukee, against which an involuntary petition in bankruptcy was filed several weeks ago, today submitted its schedules, which show liabilities of \$340,459.92 and known assets of \$325,541.36. The assets listed do not include the market value of patents, copyrights, trade-marks, etc., which it is believed will more than make up the deficiency between liabilities and assets.

The lack of working capital which is believed to have been the direct cause of the failure, is made apparent by the schedules filed today. Wages due are listed at \$12,119.07, while cash on hand amounts to \$226.55 and cash in banks and elsewhere is \$4.42.

## Crusade Against Short-Measurers

WASHINGTON, D. C., July 12—The scaler of weights and measures is about to inaugurate a crusade against garages and oil dealers who sell under-measure quantities to motorists. Warrants have been issued for the arrest of several garage men who are alleged to have given short measure and the men in question will be prosecuted in the police court.

ALCO OFFICE FOR SOUTH AMERICA—Because of the fertility of the South American market for motor trucks, the Alco truck is now being represented in the Argentine Republic. C. A. Benjamin, general sales manager, announces the establishing of an office in Buenos Aires by the River Plate Trading Co., which handles the Alco product in South America.

### Market Changes of the Week

Very few changes in materials prices took place during the past week, this being due principally to general inactivity of all markets, caused by the low ebb of business at this time of the year and also by political, disturbing influences reacting upon the markets.

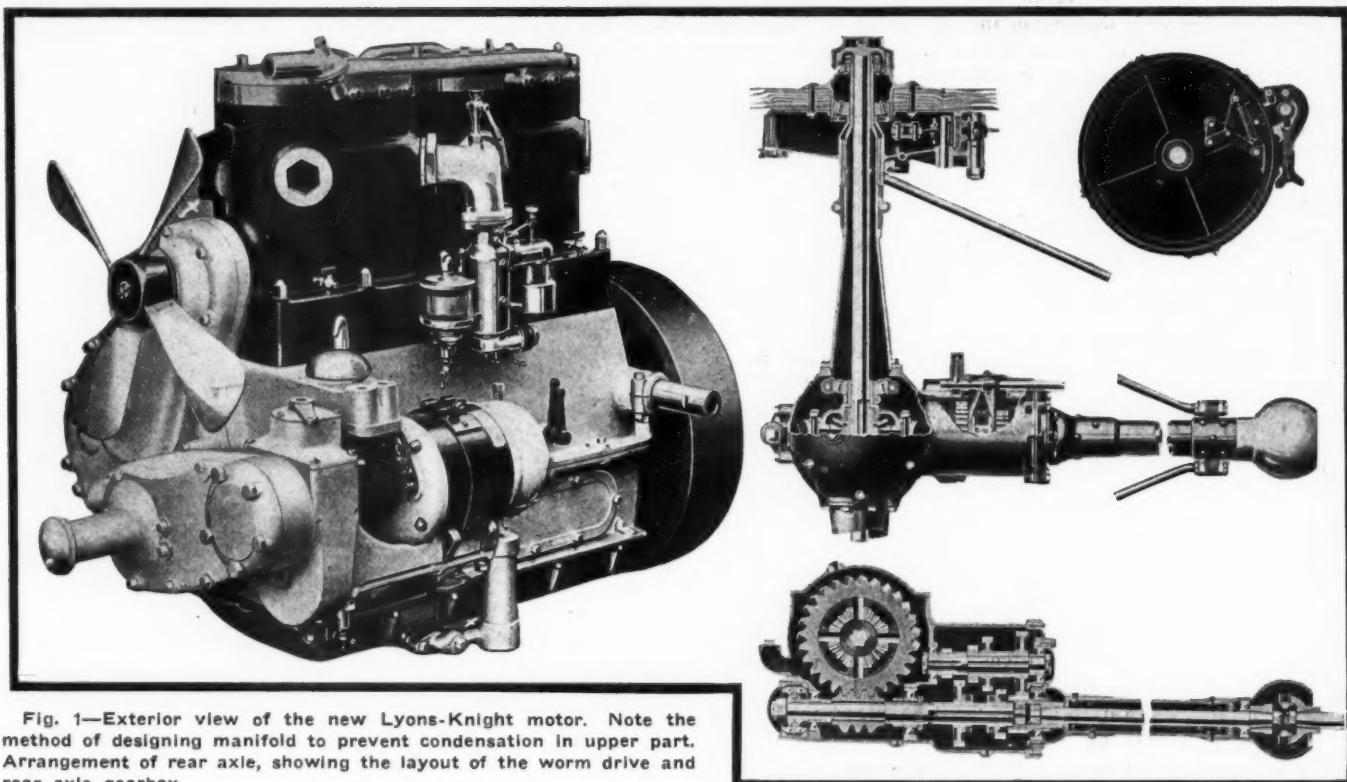


Fig. 1—Exterior view of the new Lyons-Knight motor. Note the method of designing manifold to prevent condensation in upper part. Arrangement of rear axle, showing the layout of the worm drive and rear axle gearbox

## Lyons Car Has Knight Motor and Worm Drive

### Purchasers of Atlas Plant Bring Out Distinctive Car—Gearbox on Rear Axle—Left Drive—Center Control

THE Lyons K is a new American car using the Knight motor. The Lyons company a short time ago attracted attention by its purchase of the Atlas plant at Indianapolis. Along with the purchase of the Atlas plant the new concern secured the rights of manufacture of the Knight motor and has now entered the field with a car embodying a motor of that type with other distinctive features, chief among which is a worm-drive rear axle.

The Lyons-Knight motor has four cylinders. Its bore is 4.5 inches and stroke 5.5 inches. The manufacturers claim a brake horsepower output of 50 at 1200 revolutions per minute and a maximum of 75 horsepower under full load with wide open throttle.

Although of the Knight type, the Lyons modifications give the motor a distinction which renders it different from any of the Knight engines that are at present used in this country. The chief change in this respect is in the lubrication. The Knight engines used in American cars are generally lubricated by a splash system which is regulated by a system of variable troughs that are arranged to give the scoops a greater or less dip according to the throttle opening. On the Lyons-Knight the lubrication is by the force-feed system directly to all the bearing surfaces. This includes the piston and sleeve surfaces as well as the eccentric and crankshaft bearings.

Another difference to be found in this motor which distinguishes it from others of the Knight type is the longer sleeve travel. This feature insures a greater lap over the ports and hence a stronger seal against compression leaks. The sleeves themselves have thicker walls, larger fillets and extra-heavy lugs at the bottom, giving them a rigidity against springing out of

round and making them very strong against breaking strains.

The metallurgy of the motor has been carefully studied and the latest practice in the use of materials for the different parts has been adopted in every instance. Chrome nickel steel is used in the crankshaft, connecting-rods and eccentric shaft. Aluminum has not been spared in the parts that lightness is a desirable feature. This material is found in the crankcase, chain cases and cylinder caps. All the gray iron work is done within the Lyons-Atlas plant and the castings for the cylinders, pistons, sleeves and heads are all made at home in the company's molds.

Regarding the make-up of the motor, the general features may be seen from the exterior view, Fig. 1. The cylinders are cast in pairs and the intake manifolds are exceptionally short according to the ideas of modern practice which has found that the long manifold allows condensation of the gas in the upper part even though the vaporization be good at the carburetor connection. The exhaust manifold is of substantial diameter, this dimension being 3 inches at the point at which the pipe leading to the muffler connects with the manifold.

#### Use Five-Bearing Crankshaft

There are five crankshaft bearings. The bushings are of bronze lined with babbitt. The bearings are adjusted by shims, of which four different thicknesses are used. The four crankpin bearings are adjusted in the same manner. The adjustments on the bearings are made by lifting the bushings or lowering them by the addition of more shims or the taking away of others.

The oiling system has been briefly described in the leading paragraphs. There is, however, one feature of the crankcase design which has to do with the oiling system which should be mentioned. Although the system used is the force-feed, the oil is carried in a reservoir which is located in the lower part of the crankcase. In order to keep the oil held here at a moderate temperature and to cool it before it is again required for use in the motor there is an air space between the crankcase proper and the reservoir. The space between the reservoir and the

crankcase secures another result, and that is the impossibility of the connecting-rods dipping in the oil, no matter how steep the grade that the car is compelled to climb. This prevents any possibility of oil smoke occurring when the car starts up a grade on account of the splash taking place. All the oil required is furnished by the force system and there is no splash whatever. To get the oil from the reservoir and distribute it among the various leads, a plunger pump driven off one of the eccentric rods is mounted in the base. A strainer is included in the line so that the oil, after circulating through the bearings, is freed of possible impurities before it is again used.

#### Carburetion by Double Jet

Carburetion is taken care of by a Stromberg double jet carburetor which is especially adapted to engines of the Knight type. The primary jet alone is in operation for starting and for low speeds. At higher speeds both jets are in operation as well as an auxiliary air valve which admits additional air at about the same time the second jet permits the flow of gasoline vapor. The carburetor is hot-water jacketed and there is also a tube by means of which hot air can be taken from the neighborhood of the exhaust pipe. A lever on the steering column regulates the air at the carburetor.

The electric equipment of the car is thoroughly up-to-date. A two-unit system takes care of the current for ignition, lighting and starting. One unit, the high-tension dual magneto, is used for ignition while running, with battery starting. The other unit, a combined motor-generator of the Northeast type, takes care of the lighting and starting.

The clutch used on these cars is the three-plate design, inclosed in the flywheel. On this clutch there is a central floating steel disk, faced with Raybestos. The two outside plates are compressed gradually against this central plate by the action of three powerful toggle joints.

The gearset is sliding selective. It has three speeds forward and one reverse. It is incorporated in the rear axle system. The makers claim that this method of mounting removes the strains from the universal joints and eliminates noise and vibration. The ratio of direct or third speed is 3 6-7 to 1.

Details of the worm drive are shown in Fig. 2. As will be seen, the worm is mounted below the gear and the entire unit is carried on annular ball bearings. The axle bearings are rollers. The ground clearance beneath the worm is 9 inches. The axle itself is of the floating type with a bronze housing. The extensions upon which the wheels are mounted are of drawn steel tubing. A 3-inch torsion and drag tube is rigidly connected to the front end of the rear axle housing. It in-

closes the driveshaft and terminates forward in a large hollow steel ball and socket joint which is rigidly attached to the central cross member of the frame. The brakes are mounted on the rear wheels on 16-inch drums and are 2.5 inches in width. The service brakes are contracting and the emergency brakes expanding. Both are faced with Raybestos.

Semi-elliptic front and three-quarter elliptic rear springs are used. The front are 38 inches long and 2.5 inches wide and the rear are 54 inches long and 2.5 inches wide.

An irreversible type steering gear is mounted on the left hand side of the car. The wheel is of corrugated hard rubber 18 inches in diameter. A supplementary bracket half way up the large column and attached to the dash gives it great rigidity. Shafts in the steering gear housing are hardened and ground steel, and the bearings are all bronze bushed. Steering connections are made with bearings having hardened and ground bushings and studs.

The gearshift and emergency brake levers are placed in the center of the car. The gearshift is short and close to the seat and works in an H slot with a very small amount of motion. Either side of the car may be entered at will. The throttle and spark control lever are mounted on top of the steering wheel. Gasoline shut-off valve and reserve valve are mounted on the dash within reach of the driver and an accelerator is mounted on the toe board. A push button on the dash controls the electric starter and the electric light switches are placed within easy reach. Speedometer and clock are mounted flush on the dash, as are gasoline and oil pressure gauges. These instruments may be lighted up at night by means of a dash lamp.

The wheelbase of model K is 130 inches regardless of body type, and the tread is the standard 56 inches.

Demountable rims are regularly furnished in the Q. D. type, and the tires are extra large, being 37 inches by 5 inches.

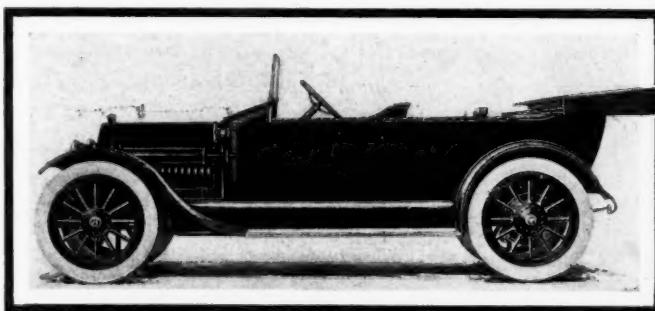


Fig. 2—Side view of seven-passenger touring car

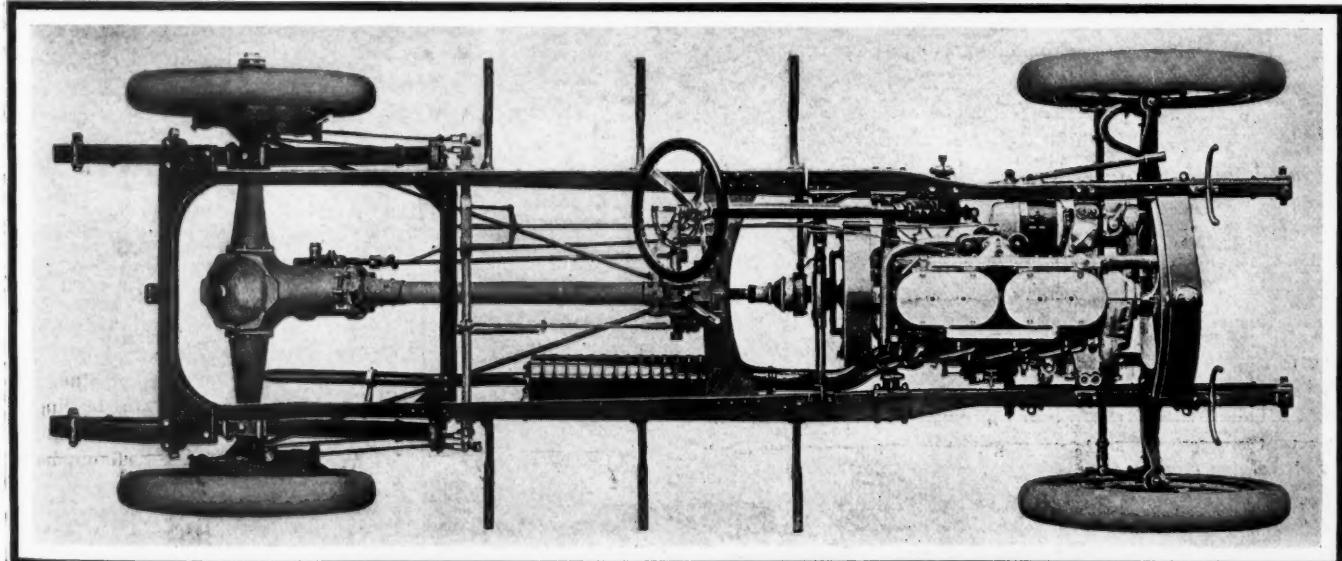
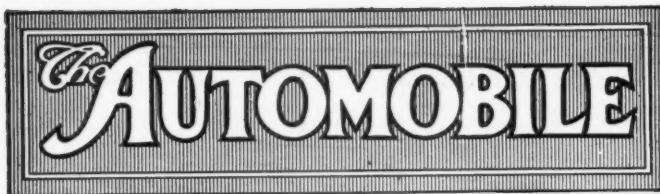


Fig. 3—Plan view of the chassis, showing left drive, center control and arrangement of the drive and torque members



Vol. XXIX

Thursday, July 17, 1913

No. 3

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 To Subscribers—Do not send money by ordinary mail. Remit by Draft,  
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Entered at New York, N. Y., as second-class matter.  
 The Automobile is a consolidation of The Automobile (monthly) and the Motor  
 Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903,  
 and the Automobile Magazine (monthly), July, 1907.

**The Trend Toward Cyclecars**

*I*n spite of the many statements recently published in the newspapers and elsewhere to the effect that the cyclecar will not be adaptable to American conditions and will not appeal to the American public, present indications render it practically certain that this type of vehicle will soon be a factor to be reckoned with in this country.

Close on the heels of the fine showing made by the little machines in the French Cyclecar Grand Prix, held for the first time this year, comes the announcement that the Chicago Motor Club has decided to include a cyclecar division in its well-known Around-Lake-Michigan run.

The man of moderate means sees in it the car for which he has been waiting, feeling that he could not afford the larger initial cost or greater upkeep of the ordinary automobile. The little cyclecars have every qualification which speaks for popular favor. They are inexpensive, light, comfortable, easy to operate and repair, use small tires and few replacements are necessary.

Recognizing the fact that the American public is beginning to want the cyclecar, several companies have recently put on the market light cars built along cyclecar lines and the interest which is being displayed by the public in regard to these machines is an excellent indication of the present tendency in regard to the latest offspring of the automobile industry.

**The French Grand Prix**

IS it the machine or the man that wins the race? For the second time in succession the winner of the Grand Prix has crossed the finishing line before his competitors. Closely following the winner another driver, who has figured prominently in the successes of the year, completed the 569 mile course within 3 minutes of the time of the winner and driving the same make of machine.

If it is Boillot and Goux who win the races, the value of these events is distinctly less as a factor in the advance in the art of building a good automobile than if it is the Peugeot car. After all the basic idea of these grueling contests is not so much for the development of the racing driver as it is for the development of the car. Granted, it takes the highest form of courage and skill to successfully guide the specially-constructed speed monsters, but granted also it takes the keenest metallurgist to make a crankshaft that will live through the contest. It takes the best designer to make an oiling system that will put the lubricant into the bearings regularly and fast enough to prevent their burning out under the tremendous duty imposed upon them when traveling over 500 miles at an average of 70 miles an hour.

The race is often lost before the driver takes his seat. The race is not decided so much at the finishing line as it is in the chemical laboratory of the maker. The heat-treating furnace is a big factor in deciding the winner. The best driver in the world is helpless with a motor that suddenly pokes its connecting-rod through the side wall of the crankcase or has its crankshaft revolving in a mass of molten babbitt. Therefore, let us give the car credit also.

All honor to the men who win because theirs is truly a herculean task. Taking advantage of every turn, nursing the car along with a desire to make all possible speed and yet to cut down delays through tire blowouts, overheated motors and the hundred-and-one other causes of failure, takes the highest degree of inborn skill. But, all honor also to the metallurgist who, in his obscure laboratory, truly advances the science with his study of the use of the alloy and the furnace. Here is where the value of the race lies, in seeing what the metal will due under the crucial test. The tensile machine, the torsion meter and all the other testing instruments do not compare with the melting and grinding tests of a 500-mile race where the speed often runs above the century mark and where the racking curves try the very entrails of the car.

Special racing machines though they be, both man and car, combine to advance the art. Without either a victory is impossible. Competition is the X-ray which vividly brings to light the weak spot. The breakage of a small part can throw out a car as quickly as the explosion of the entire engine. Let us study the results and, by the hard white light of competition and criticism advance towards the perfect car.

Let us not neglect the golden opportunities that the race affords, for after all it is not the race that is the important feature, it is the results that are gathered from the race, the knowledge that comes only through trying in the severest kind of work, that which the brain has conceived and the hand and machine wrought into final form.

# The Proper Selling of Electric Cars

*From a Paper Read Before the Convention of Electric Vehicle Makers  
in Boston by Louis E. Burr*

**A**BOUT 5 years ago a Woods electric was driven overland from Chicago to Lincoln, Neb., and about that same time another trip was made from Philadelphia to Pittsburgh over the mountains, both trips being considered remarkable at that time on account of the fact that the journeys were negotiated by an electric car.

During these journeys the men who made the runs were hampered and bothered a great deal about getting proper charging facilities and were obliged to resort to all kinds of methods and devices known to the electrician in order to charge the battery, even when they arrived at a town where there was a central station.

The central station manager was invariably courteous and ready to oblige, but was, as a rule, possessed absolutely of no knowledge regarding the method of charging an electric car.

#### Conditions Greatly Improved

I believe that should these same routes be followed at the present time, the conditions—so far as central stations are concerned—would certainly be very much improved, and it is my belief that the campaign of education carried on through the Electric Vehicle Association of America and in other ways has awakened the central station to the great possibility of the electric vehicle business as a source of profit to the central station.

I would think that a central station that can afford to would have an electric vehicle of some kind—either a commercial or pleasure vehicle—in their possession for their daily use in order to create a desire in the minds of the people in their district to own an electric vehicle, perhaps as much on account of the ease with which it can be cared for and charged as for any other reason.

It is a self-evident fact that the price at which current is furnished is a potent argument in favor of the machine, and the price should be made as low as possible consistent with the conditions. In other words, the closer the central station and the electric vehicle dealer can get together, the more business there will be for both and the greater the mutual advantage.

The question of service at the present time is a very important one. Service is a very much abused word and may be compared with the so-called "guarantee" offered by many dealers. A guarantee means exactly what the guarantor intends it to mean—nothing more or less.

Service may be catalogued under the same head. The average buyer of an electric pleasure vehicle, anyway, has so many ideas offered to him in regard to promised service, that by the time he has completed his purchase he has service, guarantee and maintenance mixed up in one portion, with the firm conviction in his mind that all these things together mean that his car can be operated without cost to him except the garage charges.

It is necessary to adopt a standard service that can be offered to the prospective buyer as a standard service, so that he may know exactly what he may expect after he puts his car in operation.

The Electric Automobile Manufacturers' Association has this very question of service up for discussion and will consider for adoption a standard service which will be, with possibly a few exceptions, as follows:

1—Free inspection once a month of car at garage or service station, provided it is sent to the station at the time specified by seller.

2—Charge will be made for this service unless car is delivered at station on day agreed upon.

3—No charge will be made for examining wiring, motor, controller, brakes, steering, running gear, or an examination of the battery to determine the time for washing or its general condition, as to whether it is being properly flushed and cared for. Nor will a charge be made for oiling the entire car, which, however, does not include repacking of bearings or gears in grease.

4—If inspection develops any needed repairs, due to natural wear, accidents or other causes, owner will be notified of same and an estimate of cost for doing the work furnished.

5—This service in no way eliminates the responsibility of the garage in which the car is kept.

If standard service is adopted by the E. A. M. A.—and I believe it will be—it will establish a precedent for the honest salesman's use and it will eventually result in an actual profit to the honest agent, for the reason that as his business grows and more cars come in for inspection each month, repairs that can legitimately be charged for will be developed more and more, until the service proposition, which is now a misnomer and a nightmare, will actually become a source of profit to the seller as well as a source of comfort to the buyer, to say nothing of the advantage it would mean to the average salesman.

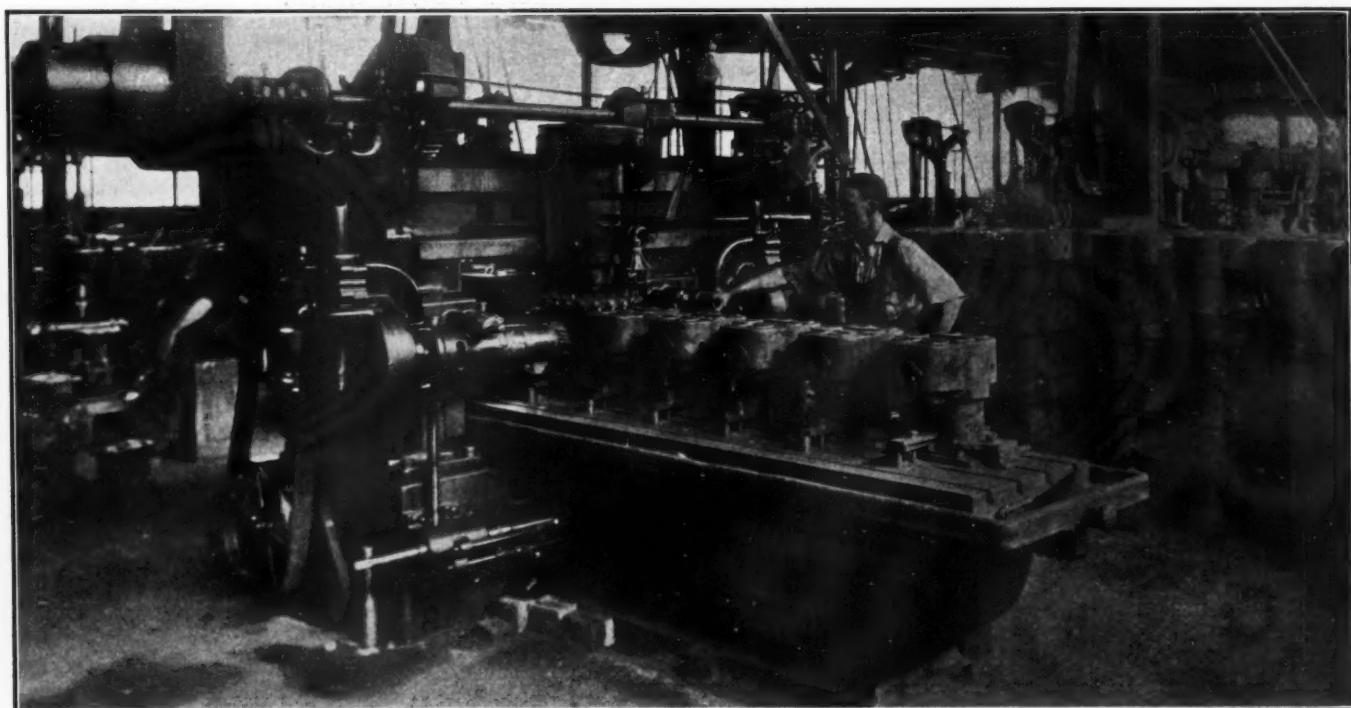
The question of the electric vehicle salesman at the present time is one that should be carefully discussed, particularly in the retail end of the electric pleasure vehicle business, and there are some things connected with the electric vehicle salesman that could at least be changed for the real benefit of the salesman and the employer.

#### Electric Salesman of High Type

The average electric vehicle salesman is of a very much higher type than is found in almost any other line. He is usually a clean-cut young man, of good appearance and manners, and must naturally be possessed of good morals. The successful electric vehicle salesman must be a man of more than average ability. To my mind, one of the deplorable facts regarding the electric vehicle salesman today is the apparent lack of fidelity to his employer and his employer's interest, and I believe the employer is really more to blame than is the salesman. The salesman has comparatively little interest in the car he sells or his employer, outside of the commission he enjoys on his sales. This seems to be the most important thing in his career, with the possible exception of the fact that it is possible for him to leave one employer, without the necessity of a recommendation of any kind, and in 10 minutes go to work for another electric vehicle dealer on the same terms as those under which he worked at his last place. He usually takes what he considers "live prospects" to the new concern and eventually, in the larger cities, anyway, he moves around from one concern to another until he has worked for nearly all. Every time he moves he reduces his efficiency, for good and sufficient reasons, and he also makes it harder for the man who takes his place, for the same good reasons.

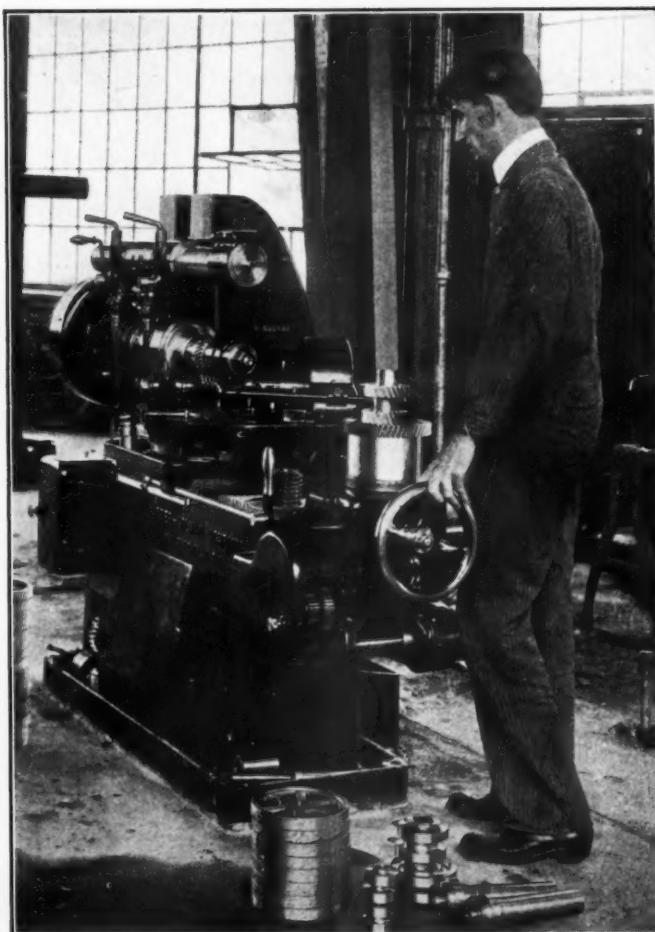
This condition, so far as the salesman is concerned, could be improved through an association as powerful as the Electric Vehicle Association of America, particularly if the assistance of the local organizations could be obtained, and I am sure it could be.

## Mills Three Sides of Six Cylinders



Upper—Showing a machine used in the Haynes plant in Kokomo, Ind., for milling the tops and sides of the Haynes cylinders in one operation. It takes one man to operate the machine

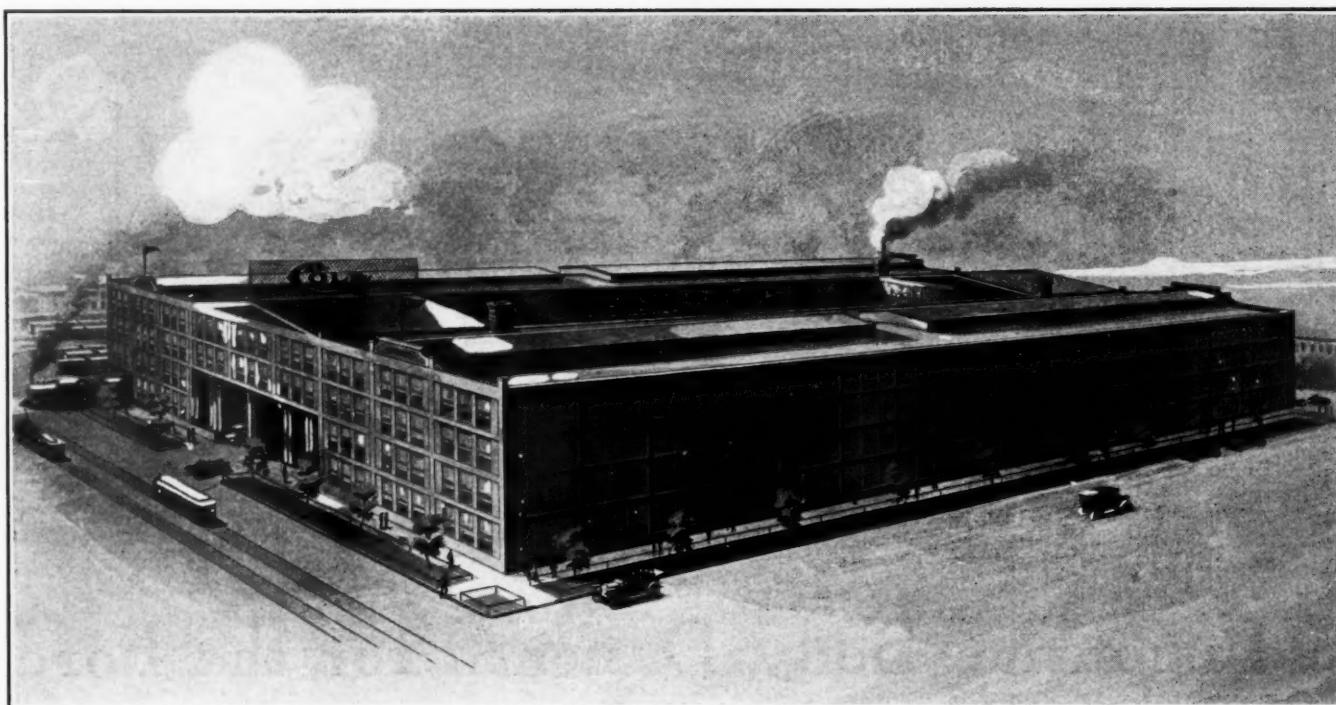
Lower—Special gear cutting machine used in the Haynes plant which has considerably shortened the work entailed in cutting the gears and which can be operated by one operator



THESE two views show two of the special machines in the factory of the Haynes Automobile Co., at Kokomo, Ind. The upper view shows a machine made by the Ingersoll Milling Machine Co., of Rochester, N. Y. This is called a cylinder facing mill and, as may be seen by the illustration, it is capable of handling six pairs of cylinders in one setting. The cylinders are lined up along the long bed plate of the machine and the cutters pass over the faces of them on both sides and on top. One man handles the entire machine. He sets up the work and takes it down. He is also able to take care of the machine itself and by being kept on this one particular line of work soon gets to know the innermost details of the machine which he handles. The machine displaces four or five of the older and smaller type and takes up much less floorspace than the others would take up. In the older types of machine the work was more than doubled because this machine not only handles the milling work on the valve cages but also faces off the manifold flanges for the exhaust and the intake on both sides of the T-head motor.

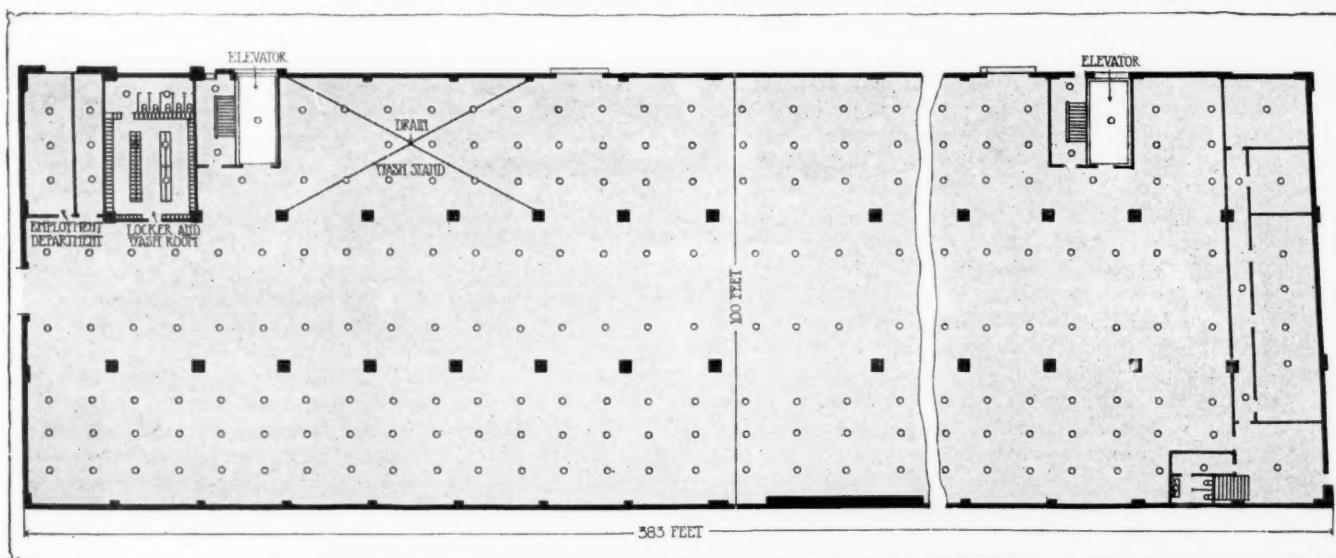
The lower illustration shows a machine made by the Barber Colman Co., of Rockford, Ill. This machine was made especially for the Haynes company and was designed to cut the gears for the Haynes motors. This machine is also designed to perform three operations at one time, that is, facing the bearing face and base of the teeth in one operation. The entire machine is of special interest because it combines work that has heretofore been done in separate operations and at the same time does the work quicker and more accurately.

# Cole Company Plans a Big Addition



How the latest addition to the plant of the Cole Motor Car Co., Indianapolis, will look, according to the architects

INDIANAPOLIS, Ind., July 12—The Cole Motor Car Co. has contracted for a re-inforced concrete building 100 feet wide and 384 feet long. Work on this building will be commenced at once. The new building is to be followed next year by another building joining it on the west, and being 100 feet wide and 215 feet long. These buildings, together with the present factory building, occupy an entire block in the heart of the city, and surround a court 50 feet wide and 308 feet long, through which all loading and unloading is done. The building now under construction is the latest fireproof modern factory construction with every possible arrangement for the comfort, convenience and safety of the employees. The building is four stories high; is provided with modern sanitary convenience; hot and cold water in all toilet rooms; ice cooled drinking fountains on each floor; modern electric elevators; stairway and elevator shaft are inclosed in brick walls with fire doors at each floor, making a fireproof passage from basement to roof. The building will be heated with a vacuum steam system, and will be kept clean and sanitary with a stationary vacuum cleaning system. The front elevation on Washington street will be faced with brick with stone trimmings. The side elevations are equipped with Fenestra factory steel sash which provides a glass surface of about two-thirds of the wall surface, and ample ventilation throughout. Herbert L. Bass & Co. are the architects, and the Bedford Stone Construction Co. the general constructors.



Plan of the ground floor of the big addition to be made to the Cole plant

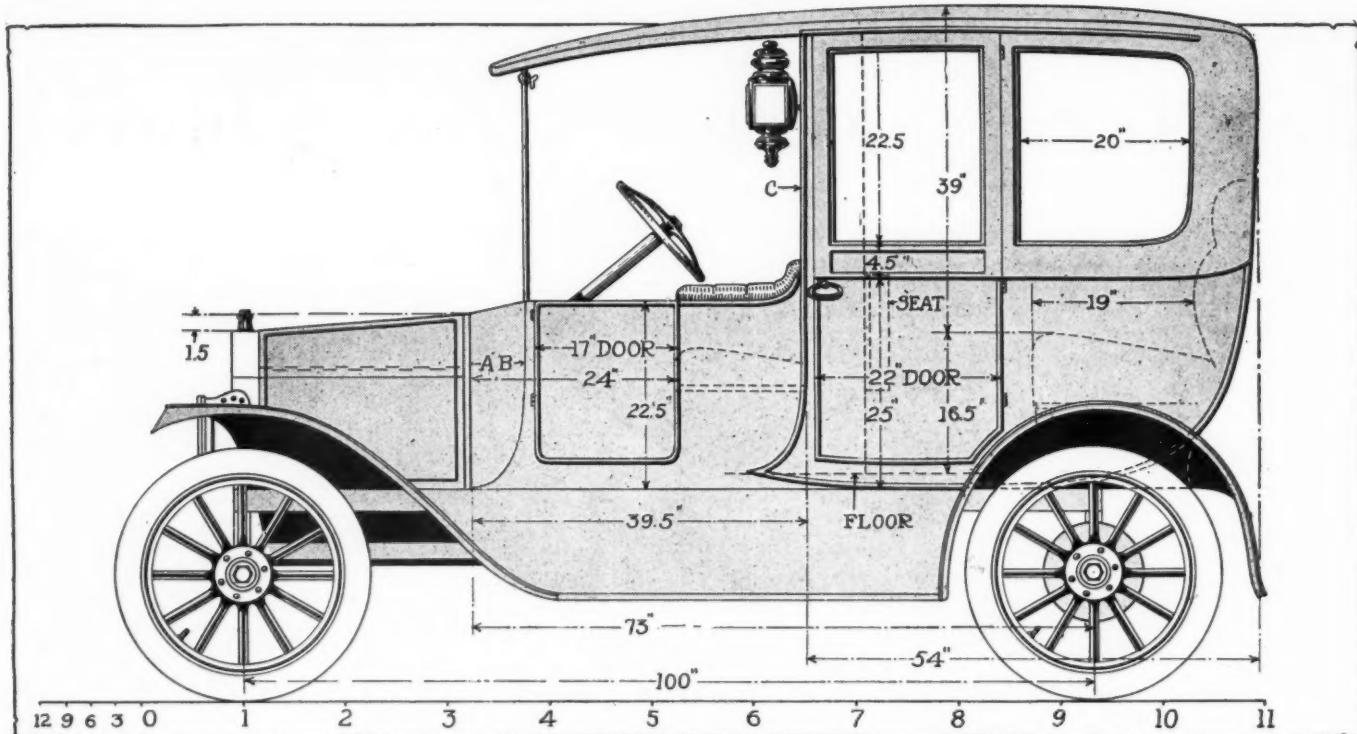


Fig. 1—Side view to scale of suggested limousine design for attachment to standard Ford chassis

## A Limousine Body Designed for the Ford

**Special Body of Good Appearance That Can Be Fitted  
Without Chassis Alteration—Provides Seating for Five**

By George J. Mercer

HERE is a noticeable tendency among automobile buyers today to be independent of the stock body. A chassis suitable in power, weight, price, etc., is selected for its merit and the buyer suits his individual taste as to the body.

The stock body built in large quantities is of a set pattern, and while no doubt exists in the mind of the customer but that it is full value for the money, and that for service and wear it will stand comparison with the best custom built body, still it lacks those nice essentials and appointments that are individually desired. And it is these little differences that make the special body a source of personal pride and pleasure to the user. Competition has stimulated the special body business, and while it is more profitable, both for the manufacturer and the customer, to build in quantities, it is equally necessary to meet the changing demands of individual taste in this respect.

A popular type of car like the Ford has many times more interested owners than any other car, therefore this chassis has been selected on which to make the experiment of showing the tendency of modern body designing. The three illustrations here shown explain how a Ford chassis will look with an up-to-date limousine mounted on it. They are strictly to scale and make it possible for a Ford owner to go to his bodybuilder and have this body made.

The chassis illustrated is the regular stock chassis, without change other than raising the line of the hood and putting on new front and rear fenders. The top line of the hood is raised, beginning from the radiator and tilting it upward toward the

dash, as shown in Fig. 1. The design of the fender is the same as used on higher priced cars.

Fig. 1 shows the side view of the body assembled on the Ford 100-inch wheelbase chassis. This chassis is too short from the rear wheel center to the dash for including a generous width of door, and as this is considered an essential point in up-to-date body design, both for the ease of entrance and for the looks, the door on the design illustrated is made 22 inches wide by cutting one of the lower corners. In addition, the front line of the coupé pillar has been moved forward so as to obtain this wide-door appearance. In order to make up for the reduced driver's space which results, the line of the front partition which forms the back of the seat has been recessed back 5 inches from the face of the coupé pillar. This is best explained by referring to Fig. 3, in which it will be seen that the driver sits in a recess which forms a partial protection in inclement weather.

It will be noticed that an attractive dip is given to the roof both at the front and rear. The quarter window is of the D type, and the rear corner of the roof is slightly rounded over.

The lower panels of the body at side and rear are of steel and the form is such that the beating necessary to shape them is reduced to a minimum. The most suitable metal for this purpose is soft stamping stock steel of No. 22 B. & S. gauge. For cutting out it is advisable to mark off from paper patterns which can be easily made by fitting over the frame. After shaping, the panels are fastened to the frame with wood screws, and when filed and sanded the molding of aluminum is applied to cover the screw heads.

The cowl is one piece of steel and the shape is formed in the rolls. At the front it is fastened to the edge of the dash and the screw heads covered with a molding, while at the rear the edges are turned to lay flat on the front face of the pillar B. A and B, Figs. 1 and 2, show the cowl from the front and from the side. The top view of the cowl is clearly shown in Fig. 3. The forward edge of the side panel terminates on the pillar B, Fig. 1, and is fastened here by turning the metal at right angles and screwing to the step or offset formed by the pillar jutting out from the cowl. The turned edge of the panel is made to cover one-half of the front face of the pillar, the remaining half being used to take the turned edge of the cowl sheet, forming a butt-joint which covers the face.

When both are secured, another strip of metal that is just the width of the pillar face is fastened over these metal laps and nicely screwed fast and cleaned off and the outer edge is rounded level with the side surface of the pillar B. This is a clean and inexpensive finish and fastening and does away with any additional moldings. The upper panels are  $\frac{3}{8}$ -inch whitewood and the back panel is butt jointed between the side panels. A bead line shows down the back on each side; this is better than a miter joint as well as being cheaper to make. The roof is the regular three-ply panel, bent to the shape of the top, and there are no bows forward of the front division.

The interior dimensions of the body are for two persons on the rear seat; this space is ample for two and will easily accommodate a child in addition. The third passenger can be carried on the auxiliary seat, shown in Fig. 3, which is so placed that the occupant must face across the car and with his back to the left side door. This is quite practicable and is the only way to accommodate an extra passenger in a body of this size and at the same time give to each passenger room enough to ride comfortably.

Special features in this design are the frameless glass windows, and as there is no wheel house, the glass can be dropped full length in the quarter as well as in the door. This is an economical feature, as when the glass projects up in the opening a few inches it is apt to be leaned on and broken. At the front the glass is in one piece across and is raised and lowered by two lifts, one at each side. Pillar lamps and grab handles on the coupé pillar are shown in Fig. 1. The handles on the fore doors are concealed, while the hinges of both doors are the straight coach pattern.

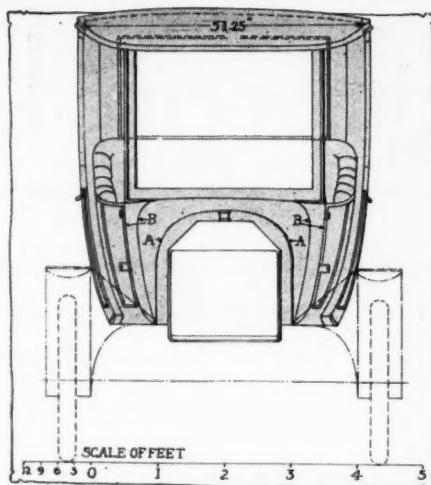


Fig. 2—Front view of limousine design

The front windshield is made with the swinging storm visor and the standards or iron supports are made with a solid foot that fastens to the cowl with two bolts in each, the wood of the glass frame covers the heads from showing. The front seat is comfortable, providing room for two persons. Waterproof curtains at the side afford protection.

The front and rear fenders are the pattern used on the best cars and the hood conforms to the modern tendency by tilting upward toward the dash. The regular chassis is otherwise maintained, the gasoline tank being under the front seat, while under the rear seat a small locker is located. If extra tires are to be carried, provision can be made on the left side runboard. The foredoor there is seldom used and the tires can be easily installed.

The weight of this body will approximate 750 pounds and the cost for a single body should be about \$650. This will include mounting on the chassis, the painting, trimming and appointments except the new guards and the changing of the hood. These latter will cost another \$75.

Although these prices may seem somewhat high when compared with the cost of the quantity-built body, the additional expense is not prohibitive to the owner whose preference is for a car that differs from the general type.

As regards painting, the lower panels could be blue with the upper panels and all moldings in black. The underside of the front roof to be stained mahogany and the front windshield to be mahogany as well as all finish moldings inside the body. The windshield standards should be painted black. The trimming to be blue broadcloth with lace, silk roll-up curtains and carpet to match. The hair and cushion springs to be of good quality, the rear seat cushion being 8 inches deep. The auxiliary seat which swings out from the front division can be made into comfortable accommodation for the extra passenger. Especial attention should be given to the design of the back.

With reference to the interior fittings, the metal parts and the dome light should be silver mounted and the front or driving seat well tufted and trimmed with black hand-buffed leather. Linoleum should be applied to the runboards and the footboards for the driver, bound with metal. The doors at the front should have pockets fitted in the trimming. A speaking tube should be placed on the left side of the car, the crystal plate glass windows should have ground edges and be provided with lift straps for raising and lowering.

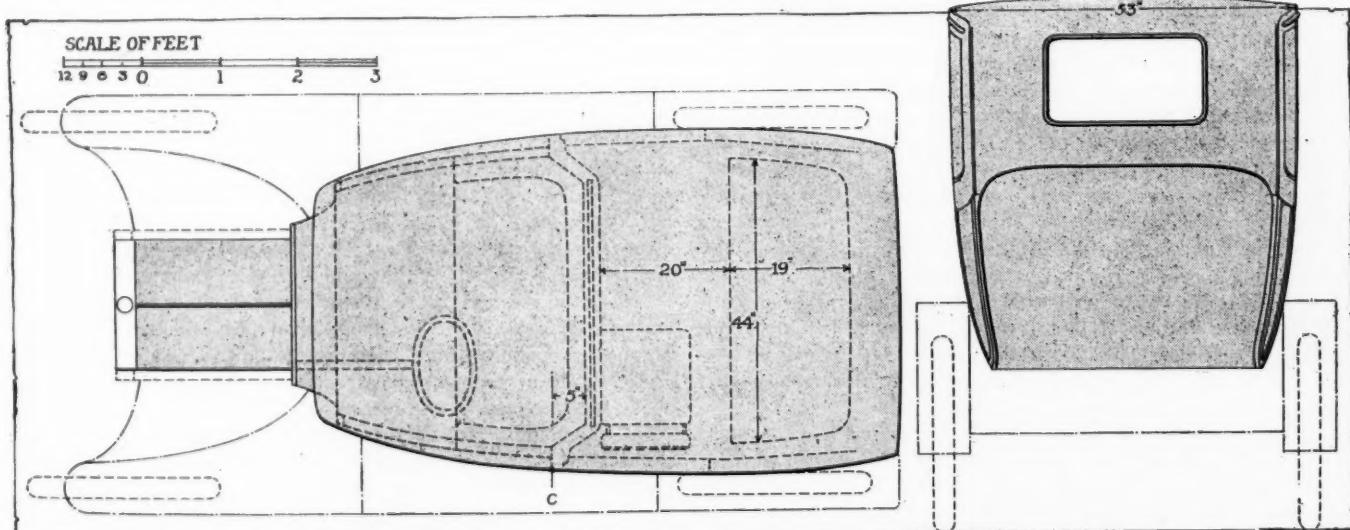
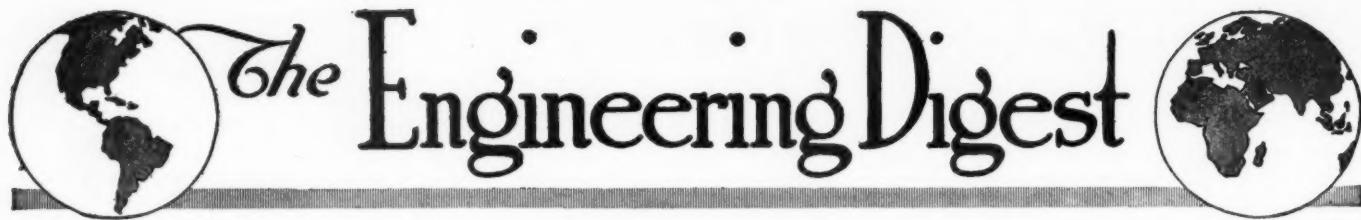


Fig. 3—Plan and rear elevation to scale of limousine body adapted to the Ford chassis



# The Engineering Digest

## Uniform Technical Standard of Road Illumination Enabling Car Manufacturers and the Public to Judge the Fitness of Automobile Lamps for Their Purposes—Latest System of Automatic Gas-Electric Four-Wheel Drive, Now on Trial

**F**OR the Better Regulation of Values in Automobile Lamps—Claims made in trade circles with regard to the illuminating capacity of automobile lamps are indefinite and of no value for comparing one lamp model with another. The same situation existed, in Germany, ten years ago with regard to all electric light-sources and led to irresponsible and misleading statements by competitors for trade, but the rules passed by the German Association of Electrotechnicians have now completely overcome this trouble, writes Dr.-Ing. B. Monasch of Leipsic, a specialist in photometry.

An automobile lamp is usually recommended by some such claim as: "This lamp gives 3,000 candle powers." Somewhat better is the information that it "gives 3,000 candle powers with a consumption of 20 liters of acetylene gas per hour and a reflector diameter of 280 millimeters." But in both cases the data are missing which would admit of estimating the economy of the lamp and its suitability for its purposes; for, as every lighting specialist knows, even small variations of the gas pressure and in the size of the burner affect the illumination greatly. In the case of incandescent electric lamps it is now required that voltage, amperage and the thermic load of the filament at which the stated light-power is obtained shall be indicated; for it is understood that a strong light can be produced by a high thermic load, which means a low consumption of watts per candle power, but that, on the other hand, the life of the incandescent thread is shorter under this condition, provided materials and other factors are the same.

With regard to the candle power of automobile lamps it is so far also never specified in what direction the stated light-power is radiated—whether it is the horizontal or the maximum power or whether perhaps the horizontal and the maximum powers are identical. The term candle power in itself may lead to an inaccuracy amounting to 11 per cent., as the American, British and French candle power units, which were standardized and made alike by agreement in 1911, are about 11 per cent. larger than the German unit, which is the Hefner candle, or, abbreviated, HK.

The candle power indication means for that matter nothing more than that a certain radiation energy may be considered as concentrated in the light-source itself, and it is now recognized in other branches of illumination that such a statement means next to nothing in practice, since that which it is of importance to know is not how strong the light is in the light-source but what effect is obtained in the place where the light is shed and is made useful. Reflectors, lenses and screens greatly affect the results. An accurate indication of the sizes and properties of these auxiliary factors is therefore indispensable for the comparison of automobile lamps. They should be judged by the illumination they produce under certain conditions upon a surface placed in certain relations to them.

If a concentrated light-source J, Fig. 1, stands at a distance of  $r$  meters from a surface AB, a light ray JC which is vertical upon AB imparts to the point C an illumination E which equals  $J$  divided by  $r$  square. But if the light-ray strikes the surface at an angle DCJ or  $\alpha$  (alpha), the illumination  $E_1$  equals only the same value multiplied by cosine  $\alpha$  (and this factor is less than

unity). The unit of illumination E is technically termed Lux or Hefnerlux in Germany. One lux is the illumination produced by 1 Hefner candle power at a point 1 meter distant. The illumination or lux is not to be confounded with the light-effect returned to the eye of an observer from a lighted surface, as here the properties of the surface play a part with regard to the absorption or reflection of the illumination received by it. Illumination proper can be conveniently calculated as well as measured. As the object of automobile lamps in the main is that of enabling the driver to recognize objects in the road in front of the vehicle, the illumination which should be measured should be that of a surface which is placed at right angles with the road and which has at least the width and height of the vehicle with its passengers, but preferably the surface should extend over the entire width of the road and somewhat above the top level of any car on which an automobile lamp may be used. It would be sufficient to determine the illumination at the corners of squares 1 meter high and wide. An important determination would be that of the illumination of such points as *a* and *b*, close to the ground, and of *d* and *c*, Fig. 2, which usually receive a minimum of light.

If it is known that points *d* and *e*, for example, receive 3 lux from a given lamp, the information is of value for comparison, and when it is also known at what gas consumption and pressure, in the case of an acetylene lamp, and at what voltage, amperage and specific watts consumption in an electric bulb this result is obtained, an estimate of the value of the lamp can be formed. With such a system the qualities of reflectors and other means used for directing the light need not be specially considered, as the better design gives the better illumination at a given distance with the same consumption of energy and materials.

It may be a question what points in a vertical surface should be selected for determining the quality of the lighting and what distance of the surface from the lamp should be considered normal. These matters should probably be decided by experiments and with a view to the practical requirements. At a vehicle speed of 60 kilometers per hour 300 meters are covered in 18 seconds. A certain time is required for sensing the nature of the objects upon which light is thrown. It is therefore clear that if a minimum illumination of a standard surface is established it should refer to a surface so much farther away from the vehicle as the latter is faster. But in practice a single standard should be sufficient, for distance as well as for shape and size of the surface and the distribution of the illumination, since the standard would be for guidance and information only and those in need of a very far-reaching light for fast driving or other unusual conditions, as well as those requiring a light of especially wide angle, would nowise be prevented from insisting upon lamps far above the standard in one respect or another.

In some lamp catalogs the need of an illumination-standard is indicated but not met; as when the specifications say: "Candle power 3,000; a newspaper can be read at a distance of 140 meters" [from the lamp, not from the reader]. The ability to read a newspaper affords however no exact criterion for illumination. An effort was formerly made for getting along with a

standard of this nature for the judging of street arc lights, but it is not taken seriously any more, because too many individual elements have been shown to enter. Even if detached letters printed on a cardboard are substituted for a newspaper to prevent the sense of words and text from assisting in the reading, those who frequently make tests of this kind, it has been shown, can read much more easily, especially if their memory is good, than persons unaccustomed to the task. Juggling with a test of this description is not excluded. In the case of automobile lamps or any other light-source from which the rays are directed by reflectors or lenses it is a vital objection to the test by reading that it does not include specific directions with regard to the exact place or places in the light-cone where the reading-matter should be held.

According to Professor Cohen, whose figures on this subject are quite widely accepted, an illumination of 60 lux permits one to distinguish objects without effort and about as well as by daylight, and he has proposed that 12 lux should be taken as the hygienic minimum. For automobile purposes, however, it is usually sufficient to be able to distinguish outlines, and the minimum of illumination may therefore probably be lower. [The author seems to have in mind public regulations according to which lamps falling below the minimum of lighting capacity would be prohibited by the police, but technically the subject of interest is of course only the establishment of a standard for the lighting of the road in front of an automobile and not the arbitrary and more or less odious restrictions to which such a standard might give rise.—Ed.]

The minimum requirements [or, better, the most suitable standard] once decided upon, it would not always be necessary to measure the illumination shed by a lamp on an actual road and with an actual intercepting surface stretched across the road, in order to get an idea of its capacity. The polar diagram of the light can be taken; that is, the distribution of the light in all different directions upon a plane laid through the light-source may be measured. Curves of this kind for a vertical plane, as AA in Fig. 4, will generally give a picture similar to that shown in Fig. 3, where the length of the lines diverging from the light source J and limited by the ellipse represents the different amounts of illumination (numbers of lux) sent out in the different directions. As automobile lamps are not axially symmetrical light-sources and as the lateral spread of the light-cone is of importance for judging the illumination of the road space in front of a vehicle, it is also necessary to take the polar diagram in a horizontal plane, as BB in Fig. 4, or for a plane of another inclination, as in the case of lamps intended to be hung high and yet not with the axis of the light-cone inclined toward the ground.

From curves of this kind it is possible to calculate how great the illumination will be at any point in the path of the automobile. Similar curves have for years been used in the arc lamp trade, and scarcely an order for arc lamps is given out by a railway company or a city administration unless the polar diagram of the candle power is supplied or known, giving definite information as to what illumination, in numbers of lux, the arc lamp sheds, with a consumption of  $a$  watts and when suspended at a height of  $b$  meters from the ground, at a point  $c$  meters distant from the base of the lamp.

In automobile circles the eventual popular and trade demand must be for an illumination diagram representing the illumination of a surface which is placed at a distance of  $a$  meters and at right angles with the direction of the road and giving the consumption of energy required; exactly as in the fields of fire arms, steam engines and city lighting other diagrams giving corresponding information are already established as indispensable for trade. [It seems to be the idea of the author that, after sufficient experience with actually erected intercepting surfaces and comparison of the distribution of the illumination on these with the polar diagrams, the automobile lamp diagrams, representing a supposed intercepting surface, might afterwards be constructed with sufficient accuracy from the polar diagrams. Several questions, such as those relating to the uniformity and workmanship of the reflector surfaces—defects in which may cause dark streaks in the light-cone—and those dealing with the color of the light rays which depend upon the materials used and have more or less to do with the penetration of the light, would still be left to the general judgment of the trade and the patrons.—Ed.]—From *Automobil-Rundschau*, June 15.

**G AS-ELECTRIC Four-Wheel Drive on the Balachowsky & Caire System.**—Before long, reliable data on the practical value of the Balachowsky & Caire electric transmission system may be looked for, as four vehicles, two trucks and two tractor-trucks, in which all four wheels are driven on this system, have been entered in the annual military endurance trials for 1913, which are now in progress in France. Operatively the characteristic of the system is that it is the resistance to the rotation of the wheels which automatically regulates the torque by which they are rotated, leaving to the driver only the regulation of the gasoline motor (in this case benzol motor) by the throttle, starts and stops by a controller and the steering and braking of the vehicle. The electric motors are placed in the wheels while the armature of the generator constitutes the flywheel of the four-cylinder internal-combustion motor, in which the dimensions are 100 by 150 millimeters bore and stroke, giving 22 horsepowers at 900 revolutions per minute.

The construction principle by which the automatic conversion of torque into speed or of speed into torque is effected is explained in substance as follows:

With electric power transmission, the available power is represented in the generator by a certain number of watts equalling the product of volts and amperes. Variations in the voltage of the current correspond to variations in the speed of the motor-shaft while variations in amperage correspond to variations of motor torque in mechanical transmissions. It is therefore necessary to be able to vary the voltage and the amperage of the current produced in the generator reciprocally in order to meet the varying requirements of propulsion. The difficulties to be overcome in this respect lie mainly in the automatic regulation and in the self-excitation of the magnets. Automatic regulation consists in making the generator current lower in voltage—by reducing the magnetic flux—when the traction requirements draw heavily upon the amperage, so that the power demanded of the internal-combustion motor when this is running at constant

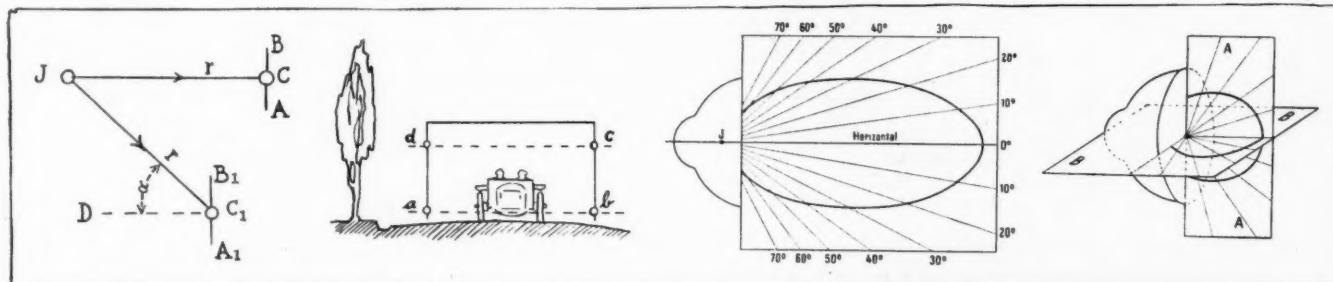


Fig. 1—Illumination influenced by angle of the light. Fig. 2—Imaginary board across the road upon which distribution of illumination is determined. Fig. 3—Lighting values of rays striking a vertical plane in axis of lamp. Fig. 4—Polar diagrams, vertical and horizontal

speed shall not vary. In practice it is necessary to have the range of the regulation extend from maximum voltage with one-third of maximum amperage to the other extreme, which is maximum amperage with one-third of maximum voltage.

A certain amount of regulation can be secured by creating a zone of compensating currents in the center of the armature generator by means of solenoids, windings in series or inverted windings and some other expedients, but the range obtained is not sufficient. To get the three-to-one range in both directions referred to, the method indicated in diagram Fig. 5, has been adopted. In addition to the two principal brushes, which are mounted upon the same collar, two other brushes are mounted upon another movable collar in such a manner that the two sets of brushes by their relative positions will bring about all the different relations to the geometrical axis which are necessary for the regulation.

If the generator is so constituted that the motor force from the armature approximates or dominates that of the field magnet there will be effected a displacement of the neutral zone with relation to the load zone which always takes place between the two brushes marked by the same letter. If these brushes are connected by a coarse-wired exciting-winding of suitable resistance, the displacement of the neutral zone will vary the difference in potential between brushes of the same lettering, and this difference will be the resultant of the electromotive forces acting in opposite directions, residing in the convolutions embraced by the brushes, these being in different fields, according to the position of the neutral zone; that is, according to the varying positions of the load zone as well.

The position of the brushes may then be determined in such manner that when the difference in potential furnished by the generator is at its maximum, the field windings are fed by a magnetizing current which contributes to the excitation of the machine. In proportion as the amperage given out by the generator increases, the neutral zone will thus be displaced, causing a diminution of the electromotive force arising between the brushes of the same letter which feed the field windings; that is, the total voltage of the machine will be reduced.

This electromotive force will pass through zero and change direction while the neutral zone continues to be displaced under the influence of the increase in amperage of the current produced, and the weakening of the voltage will continue to manifest itself till the limit of the range in variations is reached, at which moment the windings become demagnetizers.

In all of this there has been question only of the excitation which serves the automatic regulation. An ordinary coil assures the excitation of the generator. In order to obtain the excitation at low motor speed and assist in the starting of the driving wheels of the vehicle, the arrangement shown diagrammatically in Fig. 6 is adopted.

Resistances varying from zero to absolute are interposed between one of the brushes and the end of the field winding. When the resistance is absolute, the total current output from the gen-

erator passes through the winding and it is reduced progressively in proportion as the contact serving to interpose the resistances is displaced in the direction producing this effect, and *vice versa*. The zero resistance is that shown in Fig. 6.

Instead of varying the resistances by hand, the operation has been connected up with the throttle control, so that, in order to start his vehicle, the driver only has to increase the admission of gas until the power developed combines with the reduced resistance to produce a sufficient starting-torque at the driving wheels.

The construction of the electric motors in the driving wheels is shown diagrammatically in Figs. 7 and 8. The armature is the rotary and circumferential organ. The core of this armature is encased in a metallic drum, and one of the flanges upon which the core disks are mounted serves also as a brake drum B. A ribbed plate which supports the interior winding-section is provided with a flange constituting a second brake drum H. The yoke C of the field magnet is concentric with the hub and is prolonged on both sides so as to form a sleeve which is keyed to the hub and is formed externally with seats upon which the ball-bearings R of the wheels are mounted. The electric wires G pass through the sleeve in conduits bored for this purpose. The commutator is mounted directly upon the exterior plate D, so that the rubbing portions of the bars form an interior ring, and the adjustment of the bars can be effected by the clamping-rings E, Fig. 8. The commutator and the brush holders are completely protected by a metallic casing, so that the whole mechanism is watertight and dust-tight.

The operation of the vehicle involves the following movements: By means of a controller functioning exactly as a throw-over switch and placed at the right of the driver, the latter sets the connections for go-ahead, reverse or stop. This done, he acts either on the throttle lever or on the accelerator pedal to start the vehicle or increase its speed. The steering movements complete his task of driving, unless a brake action is required. Three brake systems are provided. An electric brake action is obtained by means of the controller, one movement of which turns the wheel motors into generators by enlisting the momentum of the wheels as the power and absorbing the current produced in appropriate resistances. Two mechanical brakes are actuated, one by a hand-lever and the other by a pedal, and take effect, one interiorly and the other exteriorly, on the drums of large diameter referred to in the description of the wheel motors. The pedal brake disconnects the generator when pushed home.

The whole electric equipment is made in such dimensions as to be largely superior to the power requirements. The steering of the vehicle is done through the front wheels only, and the electric transmission admits of dispensing with a differential gear. At the military trials lasting one month in which four of the Balachowsky and Caire vehicles are participating, the chief point at issue is the reliability of all the construction features of the vehicles.—From *Le Poids Lourd*, March 7.

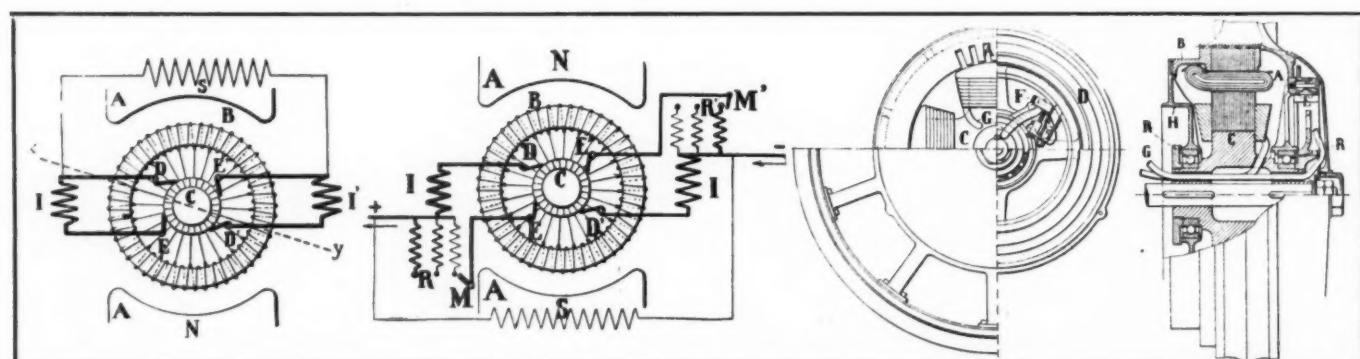


Fig. 5—Diagram of design serving to secure automatic regulation. Fig. 6—Diagram of design features serving to secure self-excitation. A field magnet; B armature; C commutator; DD' main set of brushes; EE' auxiliary set of brushes; II' circuit of compensating currents; xy neutral zone; N and S field poles; MM' movable contacts; RR' rheostats. Figs. 7 and 8—Side and sectional views of wheel motor



# The Engineers' Forum

## Sleeve vs. Poppet in Test

### Charles Y. Knight Offers a Comparison of Results of the Knight-Daimler and Packard Endurance Runs

THE recent phenomenal endurance run of the six-cylinder 38-horsepower Packard motor, conducted by the Automobile Club of America laboratory in New York City, has excited comment all over the world. Charles Y. Knight, the inventor of the sliding-sleeve type of motor which bears his name herewith presents his side of the story as brought out in the test of the four-cylinder, 38.4-horsepower Knight-Daimler motor conducted by the Royal Automobile Club in London, England, in 1909:

#### *Knight-Daimler Record Still Unbeaten—Knight*

COVENTRY, ENG., Editor THE AUTOMOBILE:—I note with interest the report made by the Laboratory of the Automobile Club of America at New York City of a six-cylinder 4 by  $5\frac{1}{2}$  inch poppet-valve motor supplied by the Packard Motor Car Co., Detroit.

I have been particularly struck with the conditions under which this motor was entered, that is, that a short test should be made at the maximum output to ascertain the power capabilities of this motor, regardless of speed, and that the motor should undertake to carry a load of not less than 70 per cent. of this maximum power output for a period of 200 hours, and that the test might continue for another hundred hours if the parties supplying the engine should so stipulate within the proper time.

It was interesting to observe that a limit of power developed by this motor was at a speed of 1,539 revolutions per minute, and that the horsepower given off at this speed amounted to 44.9—about the maximum horsepower of a standard  $3\frac{1}{2}$  by  $5\frac{1}{2}$  four-cylinder 20-horsepower motor of the Knight sleeve-valve type.

I also note that this test was heralded to the world as "breaking the record" for long endurance of a motor on the brake, the previous best performance being a run of 132 hours 4 years ago in England. The publicity department made no comparisons between the recent Packard feat and the 132-hour test of 4 years ago, neither did it inform the public that the previous record was established by the Knight sleeve-valve motor, which has remained unparalleled, and is unbeaten today, the Packard A.C.A. test notwithstanding. And in this tale hangs a bit of history, the recitation of which is necessary to clear the atmosphere and place the reader clearly in the proper light for this discussion.

At 6 o'clock on Monday morning, March 15, 1909, two Knight sleeve-valve motors, built by the Daimler company, Coventry, England, were started off upon a brake test. The test was under

the auspices of the Royal Automobile Club of Great Britain and Ireland, and in charge of a member of the Technical Committee, J. Lyons Sampson, assisted as observers by eight other engineers expert in internal combustion engine design. These motors under their supervision were to be run from 6 o'clock Monday morning until 6 o'clock Saturday evening, without adjustment or repair of any kind to the mechanism. Then they were to be placed in cars and run 2,000 miles on Brooklands and returned for final 5 hours' test on the brake, 320 hours later.

One of these motors was a standard four-cylinder 38-horsepower, with a bore of  $4\frac{1}{8}$  inch and stroke of  $5\frac{1}{8}$  inch (124 by 130 mm.). According to the conditions laid down by the technical committee, this motor was to maintain day and night during this period 1.3 per cent. of its rated horsepower, at 1,000 feet piston speed per minute, or, in other words, should the power at any time fall below this figure (which amounted to 50.8 horsepower) it was to be disqualified. Should a higher speed than 1,000 feet per minute be chosen for the test, the power developed must be increased in proportion.

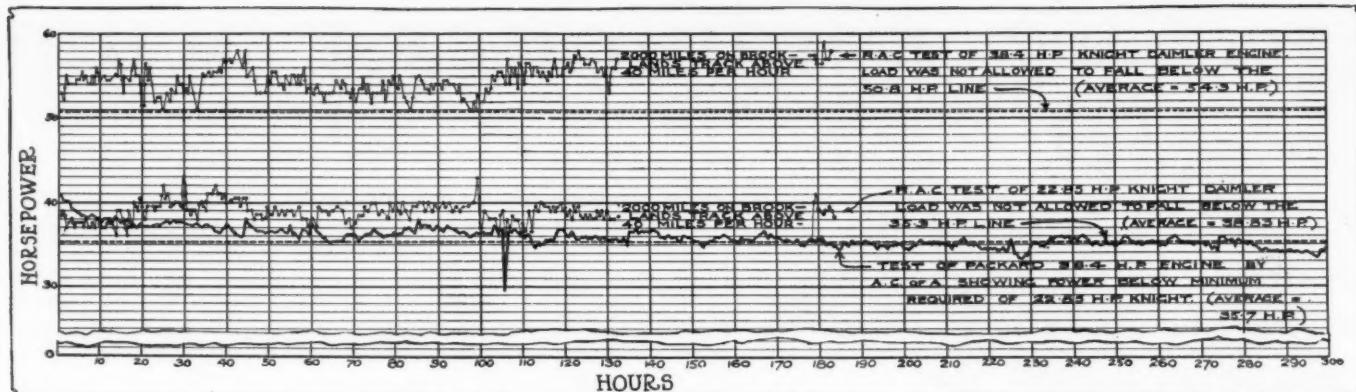
The second motor was a standard 22-horsepower motor of the same character, built by the same concern. Its dimensions were  $3\frac{3}{4}$  by  $5\frac{1}{8}$  (96 by 130 mm.), and the makers chose to enter it at 1,400 revolutions per minute, which, under the rules, required that at no time during the test should its power drop below 35.3 horsepower, under penalty of disqualification. The same conditions as to track test and other requirements also obtained as in the case of the 38-horsepower. The 38-horsepower, which was entered not to go below 50.8 horsepower, actually averaged for the 132 hours 54.3 horsepower and closed the final 5 hours developing an average of 57.25. The 22-horsepower averaged 38.83 horsepower and closed its final 5 hours pulling 38.96 horsepower.

Both motors came through their tests, but, despite this fact, numerous manufacturers of poppet-valve motors sought to belittle the accomplishment, and, as a consequence an open challenge, with a substantial deposit, was issued to the entire poppet-valve world to duplicate this record.

This test has now been history for more than 4 years. But not until the Packard company of America a short time ago announced its intention of taking up the cudgel did anybody ever get further in the direction of duplication.

I regret that we cannot truthfully proclaim to the world that the performance of the six-cylinder 38-horsepower Packard motor under discussion is the correct measure of highest efficiency of the poppet-valve engine. If we could conscientiously do this the capabilities of the sleeve-valve in comparison would be enhanced in value a hundredfold. Here is a six-cylinder poppet-valve motor of 4 inch bore by  $5\frac{1}{2}$  inch stroke, the maximum power of the A.C.A. experts found to be 44.9 horsepower, and obtained at 1,539 revolutions per minute. Now this power we would guarantee any standard four-cylinder  $3\frac{1}{2}$  by  $5\frac{1}{2}$  inch Knight sleeve-valve motor to deliver at a speed very little above 1,539 revolutions per minute. *In fact, I should not hesitate a moment to undertake to duplicate the entire Packard performance so far as power and efficiency are concerned, with a sleeve-valve motor of less than half its cylinder capacity!*

For the sake of fair comparison with the Daimler-Knight R.A.C. test I have worked out the results of the first 132 hours of the Packard motor test on the brake. For this period the average horsepower was shown by an analysis of the official figures to be 36.35, compared with 35.7 horsepower over the entire 300-hour run. Against this is placed the record of the 38-horsepower Daimler-Knight sleeve-valve R.A.C. test motor for 132 hours, which averaged over that period of 54.3 horsepower or a



Comparative diagram of horsepower curves developed by the 38.4-horsepower Knight-Daimler and the 38-horsepower six-cylinder Packard

power superiority of 63 per cent., taking into consideration the difference in cylinder volume, the Packard six-cylinder having a cylinder content of 6,864 cubic centimeters, against the four-cylinder Daimler-Knight 6,272 cubic centimeters. In power efficiency in proportion to size the 22-horsepower Daimler-Knight alluded to in the introduction showed almost 100 per cent. in excess of the Packard, the average for the 22-horsepower during the 132 hours being 38.83 horsepower.

The sleeve-valve 38-horsepower motor set for its minimum load the arbitrary figure of 50.8 horsepower, below which it must not fall under penalty of disqualification. The poppet-valve placed its minimum at 31.43 horsepower or 19.37 horsepower below the sleeve valve's point of disqualification. On the other hand, in the R.A.C. test had the little 22-horsepower  $3\frac{3}{4}$  by  $5\frac{1}{2}$  four-cylinder motor fallen below 35.3 horsepower, 3.87 horsepower above the minimum fixed for the big Packard, it would under the rules have been disqualified.

The most natural query of those interested in regard to this test is, "Why did any manufacturer permit a motor to be tested in public unless certain the result would be at least as favorable as the best previous performance?"

The fact is that during the past 4 years, ever since the sleeve-valve engines established their records of 132 hours on the brake, 2,000 miles on the track, and an additional 5 hours of bench work, the matter of time of duration of the test has been most emphasized in discussing the undertaking. Doubtless many laymen would be as greatly impressed to-day by the statement that a motor ran continuously for 300 hours pulling 5 horsepower as they would that it had during the same period developed 10 or 12 times that amount.

But engineers and well-informed motorists understand that time duration unaccompanied by extremely high power presents no problems. For instance, the mean effective pressure upon the piston of the Packard motor in this 300-hour test works out somewhere near 57 pounds to the square inch. In the Knight-Daimler test these pressures were close to 100 pounds—about 98 on the 38-horsepower. During the 132 hours the 38-horsepower Daimler-Knight motor was upon the brake it was delivering at 1,200 revolutions per minute 8.65 horsepower for every liter (1.76 pint) of cylinder capacity. The 22-horsepower was giving off 10.31 horsepower for every liter at 1,400 revolutions per minute. The Packard averaged 5.29 horsepower per liter of cylinder capacity, *little more than half the output per litre* of the 22-horsepower in the R.A.C. test!

#### *Sleeve-Valves Do Not Surpass in Power.*

It has never been seriously put forward by any responsible authority that the sleeve-valve motor is capable of greater power or speed than any poppet-valve motor of whatever design or type. The poppet-valve motor may be, and is generally, built to suit the occasion. If great power and high speeds are desired, high compression, large valves, strong springs and precipitous cams are employed. This high power and great speed produce an uncontrollable, noisy, and unreliable motor. The large valves and their seats are very susceptible to warping; because of their

large area and the increased heat of high compression they do not cool properly, and the strong springs necessary to seat them at high speeds soon weaken or actually pound the head of the valve out of shape. This spring action, seating with a force sometimes as great as 300 pounds pressure, has the same effect when the valve is red-hot (as it becomes under hard work) as pounding the head in the center with a hammer, as the large head gives in the center where the spring is pulling through the stem, the clearance between valve-tappet and cam decreases, the timing undergoes change, and adjustment is necessary to bring back the decreased power. To remedy this defect racing motors are often built with two exhaust valves to the cylinder, so they can be kept small and cool.

#### *Large Valves and Strong Springs Required.*

In order to produce a quiet, reliable poppet-valve motor, low compression, small valves, weak springs, and a gradual opening cam are necessary on account of the difficulties enumerated above. With small valves and weak springs go decreased efficiency, both in the matter of power and fuel consumption. The small valves do not admit sufficient gas to generate high pressures behind the piston, and the weak springs will not properly seat the valves at high speeds, but cause them to lag and foul the mixture by permitting the piston to draw back into the cylinder exhaust gases through the exhaust ports when the spring fails to close this port at the proper time. The powerful poppet-valve motor requires a cam capable of opening the valves suddenly and wide, and the very nature of this operation prohibits quietness, because the opening must be more or less in shape of a hammer blow. Also poppet-valves of large area require much more power to lift against the exhaust pressure at the end of the power stroke, the weight required to be lifted by the cam increasing in proportion to the area of the valve head exposed to the gas pressures in the explosion chamber.

When a poppet-valve advocate talks power and efficiency his argument is invariably based upon that type of motor which is noisy and unreliable. When he talks smooth running and reliability, he seeks his evidence from that type of motor—with small valves, weak springs, inefficient cam contour, and low compression. He does not take the public into his confidence, and the inexpert, knowing nothing of these differences, but believing one poppet-valve motor to be the same as another, is deceived by race track performances of special engines into believing that he has its efficiency in the quieter type especially designed for quietness and smooth running for touring cars.

The necessity for complying with the exacting demands of the public for reliability and quietness in the motor accounts for the comparative inefficient performance of the Packard 38-horsepower in the A.C.A. test. By increasing the diameter of the valves, altering the contour of the cams, increasing the strength of the springs and raising the compression, this six-cylinder motor might have been made to give power somewhere nearly as great as the Daimler-Knight four-cylinder 38-horsepower of less cylinder capacity. But the life of such a poppet-valve motor under the sort of test the sleeve-valve withstands would have been

of short duration. Increase the mean effective pressure of the Packard poppet-valve motor from 57 to 98 pounds upon the piston, which means tremendously raising the temperatures in the explosion chamber, and the life of the enlarged valves would have quickly come to an end.

The superiority of the sleeve engine over the poppet-valve lies in the fact that the efficiency and durability of the sleeve-valve system is not affected by high pressures. The sleeve-valve is balanced against lateral pressure and the explosion does not affect or shock it at any point. The ports are large, the inlet and outlet most effective for their area, and the action of the motor is not affected adversely by their increased size. Increase of compression up to the pre-ignition point is no disadvantage, because the explosive pressures developed are expended in useful work upon the piston, and the valves are no more difficult to open under high pressure than low, because they slide without resistance past their port openings, instead of being made to lift against pressure.

In the sleeve-valve, therefore, it is possible to combine the advantages of both types of poppet-valve motors. In the sleeve-valve is combined the silence, endurance, and reliability of the small poppet-valves and low compression with the high efficiency of the high compression, large valves, powerful springs, and precipitous cams of the racing poppet-valve motor, and the operator has in the one sleeve-valve all the advantages of both types. A standard sleeve-valve motor is capable, so far as efficiency is concerned, of delivering all the power of the racer with all the softness and quietness of the inefficient Packard, and the operator has within his control a surplus of power which he can call into service when needed in emergencies.

After the Packard A.C.A. test we believe that in future we will not hear a great deal more about the difficulties of lubricating the sleeve-valve motor as compared with the poppet-valve.

While no official record was made of the lubricating oil consumed in the Daimler-Knight R.A.C. test of 1909, an account was kept by the Daimler company, and it was well within 1 quart per hour for 54.3 horsepower average on the 38. Tests made for the purpose of ascertaining the seizing point of this size sleeve-valve motor have demonstrated that it will safely run at 1,200 per minute under full load on one-half of 1 imperial pint of lubricating oil per hour. When under test at the Panhard works in 1908 this motor was required continuously to operate with a supply of lubricating oil equivalent to 1 liter (1.76 American pint) per hour for an output of 60 horsepower.

The Packard report discloses the use of 1.07 gallons of lubricant per hour for an average of 35.7 horsepower! In fact, the oil consumption was equal to almost one-quarter of the amount of gasoline used. In its advertising announcements the Packard company stated that the motor speed was capable of carrying the car up a reasonable grade at the rate of 37 miles per hour, and that the total run of 300 hours on the brake was equivalent to 11,000 miles on the road. At this rate the motor consumed an average of 1 gallon of oil for every 35 miles at a road speed of 37 miles per hour!

The official records of the A.C.A. show that the Packard motor produced 1 horsepower an hour on .81 pound of gasoline. The R.A.C. records disclose the fact that the 38-horsepower Daimler-Knight in 1909 produced the same amount of power upon .613 pound gasoline. This is a difference of practically 33 per cent. in favor of the sleeve-valve in fuel consumption. The R.A.C. records also show that during the final 5 hours of the Daimler-Knight test the fuel consumption was .541 pound per horsepower-hour. The higher consumption over the entire period (.613) is accounted for in the fact that the gauze protecting the air intake of the carburetor from extraneous matter became choked with sawdust stirred up from the floor surrounding the motor during the 6 days' test, and the cause of the large consumption was not discovered until consumption had been largely run up and power brought down as a result of the slowly enriched mixture brought about by this choking of the air supply.

#### Comparison of Gasoline Consumption

Based upon the amount of gasoline used in the Packard brake test the consumption was at the rate of 9 road miles per American gallon at a car speed of 37 miles per hour. The actual consumption of fuel by the Daimler-Knight 38 in its road test covering approximately 2,000 miles at 42.4 miles per hour was 20 miles per English gallon (about 17 miles per American gallon), about double the Packard mileages at an average speed of 5 miles per hour faster.

The claim of the sleeve-valve motor for greater reliability is borne out by the records. Three adjustments of the valve mechanism of the Packard poppet-valve motor were required to keep it up to power. From the records one would be led to expect that after running this motor in a car for 147 hours something would go wrong with the valve system. The poppet-valve mechanism required three adjustments during this run. In all fairness under the rules the motor should have been disqualified

thereby. If altering the valve tappets does not constitute adjustments to the motor under the rules, it is pretty difficult to imagine any adjustment that could be thus construed. Two sleeve-valve motors each ran 137 hours on the brake, and in round numbers 2,000 miles on the track, and neither required the slightest attention to its mechanism.

The chart showing the power covering 132 hours by each of these motors under discussion demonstrates the strong point claimed by the sleeve-valve, namely, that the power of the sleeve-valve motor *increases* with use, whereas the power of the poppet-valve *decreases*.

For instance, the Packard motor was started upon its brake test with wide open throttle developing 41 horsepower. A very few hours of constant running served to reduce its power, and at the end of 132 hours it had decreased to 34 horsepower. *This was a loss of 7 horsepower during the 132 hours for the poppet-valve.*

#### Sleeve Type Gained 6 Horsepower.

Upon the other hand, the sleeve-valve started in at 52 horsepower (11 horsepower above the poppet-valve's start and best efficiency) and finished at 58 horsepower, a gain of 6 horsepower during the test. This means that, granting the poppet-valve had been capable of developing the same power as the sleeve-valve at the start, the sleeve-valve would have been pulling 13 horsepower more than the poppet at the close of the test, because the sleeve-valve would have increased to 58 horsepower and the poppet-valve would, should it have withstood the test, have decreased to 45 horsepower at least.

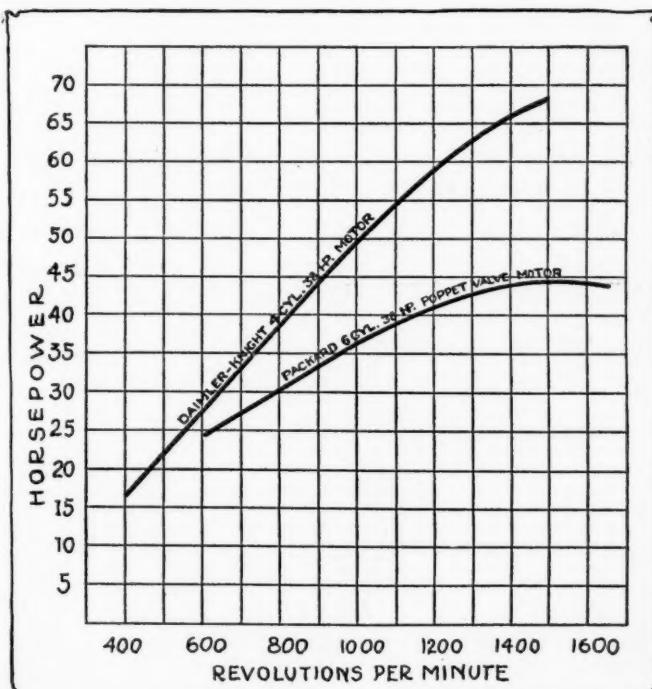
At the beginning of the test the 38-horsepower sleeve-valve showed a superiority of 11 horsepower over the 38-horsepower poppet-valve, and at the close a superiority of 24 horsepower.

I have caused diagrams to be prepared illustrating the difference between the power produced by the two motors in question.

I doubt very much whether a poppet-valve motor of very much greater efficiency than that produced by the Packard company would withstand continuous load without adjustments for a great number of hours on the brake. Certainly nobody can doubt the ability of the Packard company to produce as good a poppet-valve as is obtainable.

The Packard A.C.A. official test has established a standard by which the poppet-valve can be measured, and this standard indicates for the sleeve-valve an advantage in endurance, a superiority of more than 50 per cent. for power efficiency, about 33 per cent. in economy of consumption of fuel, and great advantage in economy of lubricating oil. Until some other poppet-valve advocate shows the world different, this will be the stick by which the standard poppet-valve will be measured.

CHARLES Y. KNIGHT.



The above diagram shows the official horsepower curve of the Packard six-cylinder 38 horsepower, 4 by 5.5-inch poppet valve motor, compared with the Daimler-Knight 38 horsepower, four-cylinder 4½ by 5½ inch, with less cylinder capacity.

# N. Y. Edison Co.'s Truck Operating System

By Means of Few Forms, All Important Information Relating to the Operation, Work and Maintenance Is Recorded

## Part I

THE New York Edison Co., which generates and distributes most of the electric current used for lighting, power and heating in New York City, has in its service no less than 125 automobiles, all of the electric type, which serve for transporting the employees of the company while on duty and for transporting material, as well as for the work of testing electric equipment all over the territory served by the company.

For this work the Edison concern has five stations in the city where electric automobiles used in its service are housed. These stations are located in Pearl street, Forty-First, Forty-Second, One Hundred and Eighth and One Hundred and Fortieth streets. The vehicles are distributed as follows:

Station	Number of Cars
Pearl street .....	12
Forty-First .....	55
Forty-Second .....	34
One Hundred and Eighth .....	10
One Hundred and Fortieth .....	14
	125

These vehicles may be classified as follows, according to their capacities and specific applications:

Seven 700-pound wagons: one delivery wagon; three for superintendent's use; three for transporting arc-light parts.

Two 750-pound wagons for the uses of inspectors and for emergency work in the Bronx.

Thirty-seven 1,000-pound wagons for carrying lamps, etc., and superintendent.

Thirty 2,000-pound wagons for carrying materials of various nature.

Six 1.5-ton trucks for transporting motors, etc.

Six 2-ton trucks for carrying materials.

One 2.5-ton truck for carrying arc-lights and setting poles.

Two 3-ton trucks for arc-light work.

Two 3.5-ton trucks for carrying heavy materials and cables throughout the city.

Car No. ....	Mfr's. No. ....																																																						
Type, Capacity, Mfg'd by, ....	.....																																																						
Wheel-Base, Tread, Color, Weight, ....	.....																																																						
Overall Dimensions; Length, Width, Height, Loading Space, ....	.....																																																						
Motors; Make, Type, Amps., Volts, Speed, ....	.....																																																						
Battery; Brand, Type, No. Cells, No. Treys, No. Sections, Weight, ....	.....																																																						
Tires; (Size) Front, Rear, ....	.....																																																						
Rec'd from Mfr's., Put into Commission, ....	.....																																																						
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Remarks: _____																																																							

Fig. 1—Front of car history and record card

20-10-10	
AUTOMOBILE ACCIDENTS. The New York Edison Company.	
Reports of accidents must be sent to 55 Duane St., Claim Department, within 24 hours after they occur. In case of serious or fatal accidents, telephone details AT ONCE to 3000 Worth, to J. C. HOBSON.	
Name of Injured _____	Address _____
Parent Age _____	Occupation _____
Extent of Injury _____	
Was surgical aid given and, by whom _____	
Did injured go home or hospital _____	
Where did the accident occur _____	
Was injured on sidewalk or crossing _____	
Kind of paving on street _____	
Did injured make any statement, and what _____	
State fully how accident happened, speed of machine, etc. _____	
<table border="1" style="width: 100px; height: 100px; margin-bottom: 10px;"></table> <span style="display: block; text-align: center;">N</span> <table border="1" style="width: 100px; height: 100px; margin-bottom: 10px;"></table> <span style="display: block; text-align: center;">E</span>	
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Witnesses _____	Address _____
.....	.....
.....	.....
.....	.....
Describe Machine.	
Vehicle Number _____	Edison Company Number _____
License Number _____	Kind of Vehicle _____
Driver's name _____	Home Address _____
Age _____	How long in Company employ _____
Previous Experience _____	
Dated, _____	
Signed, _____	

Fig. 2—Accident record form used by drivers of Edison company's trucks. Each driver always carries a number of these blanks with him and uses them in every case of accident in which his truck is involved. All slips must be promptly delivered to the office

Fig. 3—Chauffeur's daily work report

Fig. 4—Truck report blank for a day.

	RECEIVED 1928-3-10	THE NEW YORK EDISON CO.      AUTO. DEPT.
<b>DAILY STATION RECORD</b>		
NEW YORK		191

Fig. 5—Daily station report of shop men

Fig. 6—Mileage summary card for company's trucks

Fig. 7—Monthly vehicle mileage sheet. This form is used by the Edison company for keeping comparative mileages of its various vehicles. The spaces are filled in from day to day and totaled at the end of the month, after which the totals are transferred to the individual-vehicle cards. Fig. 8—Repair report for the company's trucks, giving the dates and natures of all repair operations done on each vehicle. There is a card used for every motor car owned by the company, and all cards are kept in numerical order for the sake of ease of reference

the driver so states on the form, or, if anything is the matter with it, the record tells that. As a consequence, all the repairs needed are made with the greatest dispatch.

4. If it becomes necessary to withdraw one or more automobiles from active service for the purpose of repair work, the form, Fig. 9, is used for making a record thereof. This blank is 11 by 8.5 inches, printed black on yellow paper and fits into a binder. Whenever a vehicle is withdrawn from operation, its number and the nature of the repairs necessary on it are recorded on the blank. Furthermore, a record is made of the time when it is withdrawn from work and when it is returned in good order. The time elapsed between the day of withdrawal and that of reinstatement is calculated and recorded, together with the class of trouble causing the work, and, under Remarks, the nature of the repairs and special important facts referring to that work are entered. Repairs are classified according to whether the repairs consist in general overhauling, the elimination of faulty relations in the mechanism, the making good of the effects of an accident or the results of a breakdown. In addition to this form there are ordinary repair shop records.

5. The mechanics and shop men employed at the station, besides these records, fill out, at the end of every working day,

a form, Fig. 5, 8.5 by 12.5 inches. This daily station record gives their names, the number of hours they spent at the station and a distribution of that time, telling of the work done by the men. For this record the shop men go to see the timekeeper, to whom they tell what work they have done in how much time.

6. Whenever repair work is done on any one vehicle in the service of the company, a card, Fig. 8, is filled out with the number of that truck, and the date and nature of the repair are entered upon it. This card is white and printed in black; its size is 8 by 6 inches. All repair cards are kept in a file by themselves and in numerical order so that at any time it is easy to refer to the history of any or all of the vehicles.

7. As the depreciation of a truck is more proportionate to its working mileage than to anything else, it is important that exact records of all mileages be kept. For this purpose the company uses a large yellow sheet, Fig. 7, 18.5 by 12 inches, which is kept on a board in the office and which affords space for entering the mileage of each vehicle in service for each day of a month. The numbers of the various vehicles, as assigned to them by the station superintendent, are entered in the first column of the sheet, and day by day the mileage covered is entered on the line of each truck and under the date of the day. At the end of the month it is possible to total the mileages and after this the monthly sheet is filed away, while the totals are transferred to the individual vehicle history cards.

8. These individual truck cards are 8 by 6 inches, reddish brown paper being used, which is printed with black type and lined with red and blue inks. Fig. 1 shows the front side of this blank and Fig. 6 the reverse. It is filled out, when a vehicle starts in service, with the number assigned to it and the manufacturer's name. Besides the type, capacity, dimensions and all other significant details are given on this record. There is space on it for the entries of the license numbers used for the truck during 12 years, so that the card may serve without difficulty throughout the life of the vehicle. On the reverse of the card, Fig. 6, there are eleven columns, the first being printed with the names of the 12 months, while all others are alternately marked Miles and Kilowatt Hours, the years being filled in at the top of each column.

DAILY REPORT AUTOMOBILES OUT OF COMMISSION						19
VEHICLE NO.	CLASS OF REPAIRS	OUT OF SERVICE		ELAPSED TIME	TROUBLE	REMARKS
		FROM	TO			
GENERAL REPAIRS—WHERE VEHICLE IS PUT IN SHOP FOR GENERAL OVERHAULING. SPECIAL REPAIRS—WHERE VEHICLE IS TAKEN OUT OF COMMISSION TO MAKE GOOD SPECIAL FAULTS. BREAKDOWN REPAIRS—WHERE VEHICLE GOES OUT OF COMMISSION WHILE IN SERVICE. ACCIDENT REPAIRS—WHERE VEHICLE IS DAMAGED BY COLLISION OR OTHER ACCIDENT.						BODY WHEELS AXLE TIRES SPRINGS STEERING GEAR BRAKES BATTERY MOTOR CONTROLLER OUT OF POWER

Fig. 9—Form used for reporting trucks which are put out of commission

## Among the New Books

### Works on Physics, Chemistry, Metallurgy, Welfare of Workers and the Coal Trade Are Announced

#### South and East Africa a Growing Center for Tourists and Sportsmen, According to New Guide Book

**T**HIS week the works reviewed by THE AUTOMOBILE are not so diverse in subject matter as has been the case in other collections of reviews published in this department of late. Still, there is sufficient variety to give the reader ample opportunity to find something which will be of interest to him, either in the way of business or pleasure.

Many of these works while not exactly of interest which is confined to users of automobiles or those in the automobile and allied industries, are of a nature that the automobile manufacturer and user will find of the greatest interest. The automobile user is a man whose interest is not centered in the car he uses or its mechanical side, hence there need be no hesitation in stating that the following books which are here reviewed cannot fail to interest not only the average automobile user, but also those interested in the construction of the car or its selling.

**PRACTICAL PHYSICS**, by Angus McLean, principal of Paisley Technical College, London, published by Adam & Charles Black, London, 402 5 by 8-inch pages, with 137 figures in the text. Cloth, \$1.20, subject to 25 per cent. duty.

As a text book for the students of technical schools this work offers a graded course of study in the principles of physics. The subject is gone into deeply and a knowledge of algebra, geometry and trigonometry is required of the student before his study of the subject through this work. The articles are numbered for instructors' reference and convenient lesson lengths can be chosen, owing to the segregation of the paragraphs. The experiments throughout the work are illustrated and are clearly comprehensible.

**EXERCISES IN GAS ANALYSIS**, by Dr. Hartwig Frazen, translated from the first German edition (with corrections and additions by the author) by Thomas Callan, published by Blackie & Son, Ltd., London, Eng. D. Van Nostrand & Co., New York, American distributors. 119, 4 by 7-inch pages, with 30 figures in the text. Cloth, \$1.

In this work there are series of grade exercises in gas analysis numbering forty-two. The book has been designed to cover a winter's course during which the student works about 4 hours per week.

**SAFETY, METHODS FOR PREVENTING OCCUPATIONAL AND OTHER ACCIDENTS AND DISEASE**, by Wm. H. Tolman, Ph. D., Director of the American Museum of Safety, and Leonard B. Kendall, published by Harper & Bros., New York. 422, 5 by 8-inch pages, illustrated. Cloth, \$3.

The inefficiency of accidents is one of the greatest blots on our modern civilization. The tendency, however, is in the other direction, and this is so because of the organized study which has of late been directed towards the education of the risk taker. Stringent employers' liability laws have forced the large concern employing thousands of workmen to take the utmost precaution against unnecessary injury and loss of life. This work is filled with specific instances of the use of safety-increasing devices and shows the practice and reasons for the adoption of safety devices in many large modern plants. The conditions peculiar to the various types of work to which risk is attached are studied by the authors and many specific devices for the protection of the workmen are illustrated and described. To quote the author, on page 245 he says: "An effective measure for protection against occupational accidents is the selection of workers

whose physical qualifications develop high resistance. Only those of the best physique should be employed in occupations endangered by poisons." On page 261, speaking of industrial poisons, he states: "In calculating the amount lost every year through sickness and reduced speed on the part of the operator, it is well to consider this seemingly minor point: whether the poison-laden air is drawn away from the employee or flows past his nose and mouth." The book proves the economy of installing safety methods in the plant.

**QUALITATIVE DETERMINATION OF ORGANIC COMPOUNDS**, by J. W. Shepherd, published by University Tutorial Press, Ltd., London, Eng. 348, 4.5 by 6.5-inch pages, with numerous figures in the text. Cloth, 6 shillings, 6 pence.

This is a handbook giving a chemical formula for the combination of organic compounds. As the author states at the very beginning of his work, organic chemistry may be defined as the chemistry of the carbon compounds. Even though the definition would seem to include many compounds generally considered inorganic, it is more convenient to include them in inorganic chemistry. This includes such compounds as carbon-dioxide. The complex reactions of organic chemical combinations are given in a clear manner and the work should be handy for an all-around reference book.

**METALLIC ALLOYS**, by G. H. Gulliver, published by Charles Griffen & Co., Ltd. 409, 5 by 8-inch pages, with 310 figures in the text. Cloth, \$3.25.

This is a handbook for metal workers and students of metallurgy. Many micrographs of metallic surfaces are given and the valuable study of the effect of each alloy on the different metals with which it can be combined should interest anyone who works in any way with metal. The effects of chilling, annealing and vibration as well as the fatigue of metals are dealt with specifically. Equilibrium diagrams for different combinations of metal are given and studied in connection with the different combination of metals and alloys.

**HYGIENE FOR THE WORKER**, by Wm. H. Tolman, Ph. D., and Adelaide Wood Guthrie, published by the American Book Co. 231, 4 by 7-inch pages, with numerous zinc engravings. Cloth, 50 cents.

Care of the person should be the first thought of the workman who exposes himself in any way to the gaze of his fellow-workmen. The simple rules of hygiene should be observed and are very easily carried out. In this work Dr. Tolman has pointed out the important rules to follow and also has given many little hints which if everybody followed would make the world much cleaner and brighter. The book should be read by young people.

**THE GUIDE TO SOUTH AND EAST AFRICA**, edited annually by A. Samler Brown and G. Gordon Brown, 1913 edition, published by Sampson, Low, Marston & Co., London, Eng. 695, 4.5 by 7-inch pages, with colored maps, plans and diagrams. Boards, 2 shillings, 6 pence.

Africa is a rapidly growing center for tourists, sportsmen, invalids, etc. This work gives a mass of condensed information regarding the climate, geography, game and qualifications as a health resort of every part of south and east Africa. The descriptions are brief and concentrated and an enormous amount of data to an intending visitor of the dark country is furnished in its pages.

**COAL TRADE**, by Frederick E. Saward, editor of the *Coal Trade Journal*, published by the *Coal Trade Journal*, New York City, 200 6 by 8-inch pages. Cloth, \$2.00.

This is entirely a compendium of information without any attempt at presenting anything but facts relating to coal and the coal industry. The information deals with the production, prices, transportation, etc., of coal both at home and abroad and the figures are corrected up to the date of going to press, which includes a full account of the year 1912. Where and how the coal used throughout the world goes can be readily determined by the use of this book. The shipments over different railroads are given as well as the tonnage handled at large centers.



# The Rostrum

In which Letters from Readers  
Are Answered and Discussed



**Likes Central Gearbox Location—Disk Clutch Has To Be in Good Condition for Easy Engagement—Causes of Carbon Deposits Outlined and Discussed—Batteries Burn Out Rapidly and Motor Stops Abruptly—Stoddard Parts**

### Believes Strongly in the Midway Location of Gears

**E**DITOR THE AUTOMOBILE:—I have read with interest several letters in the Rostrum discussing the merits of the three gearbox locations, but feel that I cannot let the letter in the last issue subscribed by C. V. B. of St. Louis, Mo., go by with merely passing interest and without making some comment, if only to add my approval to his carefully-prepared document bristling with gems of hard old practical experience. Evidently he knows his subject and knows what he is talking about. I may have been already biased in favor of the midway location, but it seems to me, as a layman, that there ought to be three essential parts to an automobile or any machine, for that matter, worth talking about. In the automobile, the motor forming the primary, the midway gearbox the nucleus or backbone, and the differential bringing up the rear, thus forming a simplified and harmonious design.

Brewton, Ala.

—Our St. Louis correspondent, who desires to conceal his identity under the initials C. V. B., makes the following points in stating his preference for the amidship position of the gearset:

1—The gearset when a unit with the motor is inaccessible, becomes noisy on account of misalignment and is hard for the average repairman to manage.

2—When a unit with the rear axle the housing suffers from strains which are unavoidable.

3—The best rear axle system is hard to get at, is heavy and causes undue wear on the rear tires.

4—The amidship position is the most accessible, costs the least to repair and is easiest for the average repairman to handle.

**Q** Do you agree with these gentlemen? Car owners who have had experience know how to judge a question of this nature perhaps even better than the engineers who design the cars, because they are more in a position to judge the upkeep. The Editor would welcome a thorough threshing out of this matter in these columns.

**Q** In answering this question car owners are directed to the fact that one of the leading arguments advanced against rear axle location is that of increased axle weight and consequent tire damage. Definite information on this line would be in order.

**Q** Those not in favor of the amidship location have urged against it lack of accessibility.

**Q** The gearbox as a unit with the motor has been criticised in that it is not suitable for a heavyweight car because of the fact that too much weight is placed in front.

E. M. BLACKSHER.

### Disk Clutch Drags or Slips

**E**ditor THE AUTOMOBILE:—I have a Chalmers 30, 1909 model, on which the disk clutch has given me a little trouble. If I change the proportions of oil and kerosene in the clutch case so that if the clutch does not drag in starting it will soon begin to slip a little when on the road a few minutes. I have flushed out the clutch repeatedly and tried various proportions of oil and kerosene and have also tried various tensions on the clutch springs, but without much success; the clutch either drags or slips. It has been suggested to me that I try stiffer springs on the clutch, sandpaper the disks and put in additional disks. Do you think any of the suggested remedies are practical, and if not, what do you suggest?

Nordhoff, Cal.

—The probability is that your troubles would be cured if you would substitute a new set of bronze disks. As these disks are softer than the alternate steel ones, they wear away in time, especially if the clutch has been slipped habitually. Some drivers are in the habit of slipping the clutch perpetually when working in traffic or even when touring. This will cause more rapid wearing of the softer disks than if the car speed was not governed in this way. It will be a simple matter for you to determine if the disks are worn by picking them up one at a time in your fingers, holding them at the edge. If you shake them and they are not rigid, but bend, they are worn too thin.

P. PIERPONT.

The clutch spring should not be taken up very much. Not more than three turns on the adjusting nuts are necessary to give the springs all the tension they need.

Putting in extra disks will not help the clutch. The type you have on your car is designed to have twenty-five disks and the addition of others will disarrange the layout to such an extent that you would hardly be able to disengage it. Sandpapering the disks is also unnecessary. If the disks are not clean wash them with gasoline or kerosene. This will remove all the grease which has caked upon them and will not allow them to slip. The half-and-half mixture of kerosene and oil advised by the company is in every way sufficient as far as lubrication of the disks is concerned.

Unless a disk clutch is in the pink of condition, it will tend to grab when starting the car. This can be overcome by cleaning the disks about twice a season and keeping them lubricated in the manner specified by the makers. There is such a difference in the design and construction of disk clutches that they nearly all have to have slightly different treatment in order to keep them working at their highest efficiency. This is particularly so in the quality and quantity of lubricant required.

If the plates in the clutch have been buckled or bent out of shape, the trouble you mention may readily develop. It is necessary that the plates be absolutely flat in order that they take up the pull of the car gradually. The multiple disk clutch

when in good condition has an equal amount of friction between each alternate disk. If one disk is bent or out of round, it will not be possible for the friction between that and the next disk to be the same as between the next pair of disks, which may be flat. This irregularity in frictional contact will cause the grabbing and slipping action which distinguishes the disk clutch when in poor condition.

### From Roanoke, Va., to Detroit, Mich.

Editor THE AUTOMOBILE:—Please give me a route through the "Rostrum" from Roanoke, Va., to Detroit, Mich.—the most direct route with good roads.

Christiansburg, Va.

—The best route to take is that shown in Blue Book volume 3, through Staunton, Middletown, Winchester, Capon Bridge, Romney, Cumberland, across the Pennsylvania border to Addison, Uniontown, Washington, Pittsburgh, Beaver Falls, then into Ohio, striking Youngstown, Warren and Cleveland. From Cleveland the route is directly around the lake shore to Detroit. By going this way you will strike the best roads and the distance will be as short as any other way. No matter how you go the roads will be very bad in wet weather, as many of them are clay. In dry weather the roads are all fair to good with perhaps some stretches of bad sand.

### What Causes Carbon Deposits

Editor THE AUTOMOBILE:—I have had considerable trouble with carbon deposits on piston heads and in compression chambers of four-cycle motors. I understand this is due to the use of oil of low flash point and of nondescript make. Please advise if this is true and, if so, what is the minimum flash point of oil that is safe to use on water-cooled motor of 1,200 maximum revolutions?

New York City.

F. J. McCULLOUGH.

—If there was enough air in the cylinder at the time of explosion to consume all the carbon in the cylinder there would be no carbon deposit. There are two agents which contain carbon and which are present in the cylinder at the time of explosion. These are: 1—a mixture of gasoline and air, and 2—a quantity of lubricating oil. Both these are sources of carbon trouble and both are necessary, therefore it is the object of the operator of the car to so make his adjustments and other arrangements that the carbon troubles will be kept to a minimum. First, let us consider the question of carbon deposit from the fuel, that is, the gasoline and air.

Theoretically, it would take about eight parts of air to one of gasoline to make a mixture that would burn without leaving any residue. Practically, we are using on the average, with a well-adjusted carburetor, about thirteen parts of air to one of gasoline. We are still getting carbon deposit from the gasoline. That is carbon which is uncombined and at the same time our exhaust gas analysis shows that we are exhausting a percentage of unused air. Regarding this matter an authority has said the following: "Carbon accumulations are frequently due to gasoline. In the past there has been so much talk about the cracking of the lubricating oil and the formation of a deposit of carbon out of the same, that automobilists generally labor under the false impression that the excesses of carbon, of which they so justly complain, are entirely due to the use of poor oil, or the flooding of the cylinders with the same. It is highly improbable that a pure hydro-carbon lubricating oil will deposit carbon in the combustion chamber space in sufficient quantity to give any trouble at all. If the lubricating oil is adulterated with resinous oil there may be some cause for complaint. Automobile gasoline is at the bottom of a large percentage of the carbon trouble, it being the case that this type of gasoline volatilizes but slowly at best, and, unfortunately, it is a fault of carburetors in general to deliver an excess of gasoline at the higher range of speed if the amount of gasoline is in the right proportion at the low speed. For the purpose of illustrating the

lack of volatility of automobile gasoline all that is necessary is to take a blow-torch, fill it with automobile gasoline, light the torch in the regular way and set it down in front of a plate at a distance of four or five feet from the same, and then by turning on the gasoline so that it squirts out with considerable pressure it will be found that the more volatile fractions of the liquid will burn, and the less volatile parts will strike the plate and fall down to the ground without burning at all. If this less volatile product is collected in a pan there is a considerable amount of it, and it is then allowed to cool off, as a further proof of its non-volatile properties a piece of newspaper may be set on fire and thrown into this pan of liquid, only to find that it will quench the flame. The non-volatile part of the average automobile gasoline mixture is not far from 50 per cent. of the whole content."

Probably the above exaggerates the proportion of trouble due to gasoline as compared to oil, but it does show what the causes of the carbon deposit from this particular source are. With the gasoline we are now getting it is necessary to divide the liquid fuel into the finest possible spray in order to render possible its complete vaporization. This is out of the scope of the car operator, however, and need not here be enlarged upon. Suffice it to say that, in order to minimize carbon troubles, and at the same time to secure the most from the fuel, give the motor as much air as it will stand and still have power at high speeds and on hills.

Regarding oil, the first big feature which cannot be emphasized too highly is that it is of the utmost importance to buy good oil. Buying oil of nondescript brands and of unknown origin is a costly practice because it shortens the life of the motor, causes carbon deposit and, in some cases where the oil is very bad, actually eats into the metal of the cylinder on account of an acid content.

It is the free carbon in the oil which causes the greatest trouble. Next to that is the admission of oil in too great a quantity. A smoking motor is always a soot-producing motor. This means carbon deposit. When the lubricating oil is admitted in correct quantities the excess air is sufficient to entirely consume the small percentage of oil that works its way past the piston rings into the combustion space.

The free carbon is taken from the oil in the process of manufacture by filtering again and again until the oil becomes light

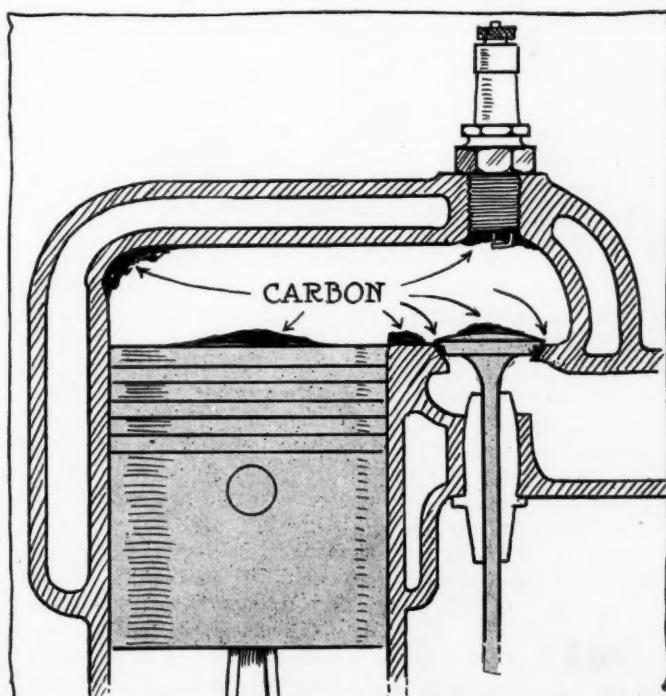


Fig. 1—Where carbon deposits are prone to gather

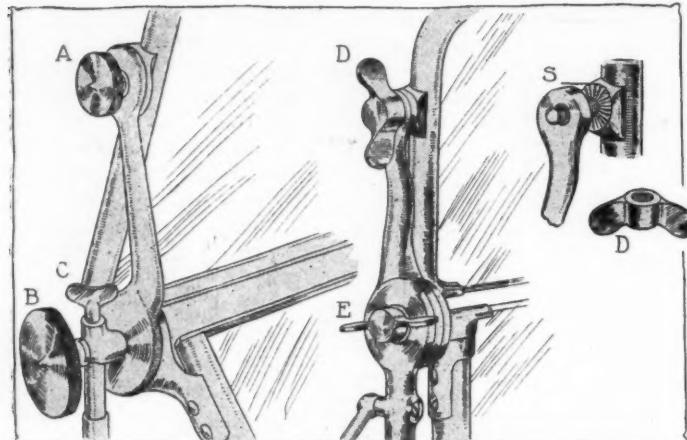


Fig. 2—Windshield locks used on various well-known makes

in color. It is the filtering process which varies with different grades of oil that causes the difference in price of oils that are refined from the same crude. If more care is taken in the manufacture of the oil it will cost the consumer more, but that amount of money is well expended in purchasing a lubricating oil that will not only lubricate the engine better but at the same time will cut down the carbon deposits and lessen the trouble that the driver or owner has with his car. The expense caused by carbon trouble cannot be exactly traced because it appears as an indirect factor in repair work as well as in the fuel bill, etc. Buy a good, well-known brand of oil that sells at a fair price. Ask the manufacturers of your car what oil they recommend, both as regards make and grade, that is, heavy, light or medium. This applies not only to the motor but also the gearset, the differential and to the cups throughout the entire car. Specifically the flash point should be about 400 deg. Fahrenheit.

#### Motor Stops—Suspects Ignition Trouble

Editor THE AUTOMOBILE:—I have an Everitt 30, 1912, which has been giving me a lot of trouble, has cost me a great deal, and which no one seems to be able to remedy. The trouble is as follows: I have burned out three sets of batteries, and while running the other day at about a speed of 30 miles, my car came to a stop. The car was then running on the magneto. I switched on the batteries, cranked, and it would run a few minutes and then stop. I did this several times, and finally stopped altogether. I also noticed that my coil at the dashboard seems to get hot as if there was a short circuit. My magneto is a Bosch, and only 1 year old. Previous to this stopping I had just made a run of 52 miles in 1 hour and 40 minutes, allowing for slowing down through the villages. I made an average of 40 miles per hour when outside.

Sag Harbor, L. I.

G. F. SCHEFKE.

—The low-tension wire which is used for cutting out the ignition is probably short-circuited. Remove this cable from the nut which holds it and try running the motor. The location of the short circuit will have to be found by search, as it is impossible to tell where these exist. Sometimes a partial short circuit can be located by running the car in the dark and watching for sparks. When the ignition cut-out wire is removed, if the car runs, a replacement of this wire with one on which the insulation is in good condition will effect a cure.

The carbon of the distributor disk should be examined. This can be done by removing the distributor disk.

Irregular firing taking place owing to incorrect working of the contact breaker may be ascertained by moving the flat spring aside, removing end cap, and then seeing that the screw is properly tightened; also that the steel segments as well as the two platinum screws are properly tightened. Further, the platinum points have to be examined to discover whether they are exactly  $1/32$  inch apart when the bell crank is depressed by one of the steel segments. If necessary the platinum contacts have to be

carefully cleaned and any oil or grease removed, and if they should be uneven they may be filed flat by means of a fine file. It is to be especially noted that the contact lever moves freely. The pivot of this works in a fiber bush and accordingly should not be lubricated. It may happen occasionally on new magnetos that owing to the expanding of the fiber bush the contact lever is prevented from working freely. By slightly widening the bore of the fiber by means of a reamer the fault can be rectified.

In order to remove the contact breaker, unscrew the contact breaker screw.

#### Parts for Stoddard-Dayton Car

Editor THE AUTOMOBILE:—Will you kindly tell me from whom I can obtain repair parts for Stoddard Dayton cars, and in particular where I can get a front wheel hubcap for a 1910 Stoddard Dayton 30?

W. H. KAYSER.

San Diego, Cal.

—Parts for the Stoddard Dayton car can be ordered from the Stoddard Dayton Parts Department, New Castle, Ind. They will be able to supply the hubcap or any other parts for the 1910 model.

#### Buffalo Man Somewhat Incredulous

Editor THE AUTOMOBILE:—Referring to the editorial in THE AUTOMOBILE for July 3, entitled "A Lesson in Fuel Economy" and dealing with the Franklin economy run, would say that this is buncombe. How many gallons of lubricating oil did they use?

Buffalo, N. Y.

C. A. SNOW.

—The quantity of oil consumed by S. G. Averell's Franklin car which made 83.5 miles on 1 gallon of gasoline June 20 in a test conducted by the Automobile Club of America, was so small as to be negligible—less than  $1/8$  pint. At this rate the car would have made 5,344 miles on a gallon of oil. The official report of the Automobile Club of America says regarding the oil consumption: "An effort was made to measure the quantity of lubricating oil used by filling the splash pans to a certain level at the start and adjusting the level in these, and in the lubricator at the end of the test, to this same point. The consumption was too small to be accurately measured by this method, being somewhat less than  $1/8$  pint. The exhaust from the motor was notably free from smoke."

#### Carbureter for Low-Gravity Fuel

Editor THE AUTOMOBILE:—I am going to construct a kerosene carbureter which will be placed on a two-cylinder model F Buick, cylinder 4.2 by 5 inches, which is equipped with a Schebler D 1.25 inches.

In the construction of this carbureter I propose to vaporize the fuel before it is mixed with the air; use two jets and a spring-controlled auxiliary air valve.

—What is the boiling temperature of kerosene of 43 degrees Beaumé? The kerosene will pass through the two jets in the form of vapor.

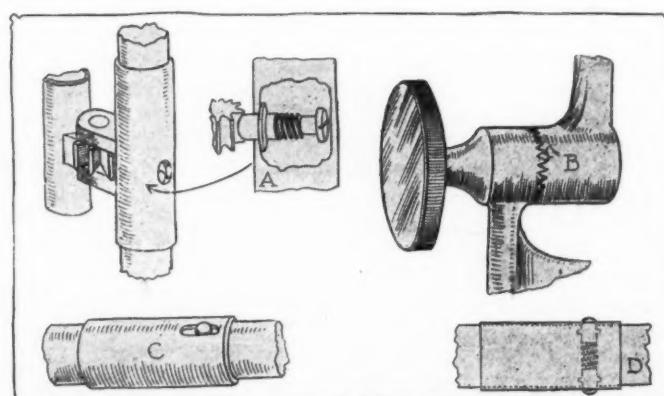


Fig. 3—Details of fasteners and adjusters for windshields

2—What should be the diameter of the orifices of the jets?

3—While this carbureter is in the experimental stage, I intend to use acetylene to supply the heat necessary to vaporize the kerosene. Will two 0.25-inch burners generate enough heat for this size carbureter?

So. Auburn, Neb.

G. W. R.

—1—The boiling temperature of kerosene is given as 400 degrees C.

2—The diameter of the jets will depend altogether on the size of your other passages and consequently upon what basis you are figuring your gas velocities. If you have a low velocity of air past the jet you will need a large area of jet opening to compensate by volume for the lack of speed. The size of the orifice differs for different designs of carbureter and it is thus impossible to calculate the area of the jet unless more is known about the general design of the carbureter.

3—The acetylene burners will give you all the heat that is necessary to vaporize the kerosene. Of course, much depends upon the method of application of the heat, but you have enough at your disposal to melt the metal of the carbureter if you apply any quantity of pressure.

### Changing Suspension of the Maxwell Q

Editor THE AUTOMOBILE:—Would thank you to let me know whether or not by changing springs on the Maxwell Model Q rear springs from three-quarter elliptic to elliptic, radius rods are rendered necessary. Please answer through THE AUTOMOBILE.

Donnellson, Iowa.

W. J. SCHMITT.

—It will be perfectly feasible for you to take the drive through the springs if you so desire and radius rods can be dispensed with.

### Locking the Windshield in Position

Editor THE AUTOMOBILE:—I desire to purchase a windshield for my car and there are so many types on the market that it is impossible for me to tell exactly what I want. As I am somewhat out of reach of any place where an extensive supply of automobile accessories is kept on hand, I want you to tell me what type suits the following requirements: The shield I want must be adjustable in that I must be able to raise or lower it to receive the wind or to cut it off. Furthermore I need the rain-vision feature. I want a windshield that will be a decoration to the car rather than one that will give it a clumsy appearance. Please tell me what you would suggest.

Looneyville, W. Va.

READER.

—There is hardly a windshield on the market, except a few of the fixed type, that does not meet your requirements. Referring to Figs. 2 and 3, the fastenings which give the windshield the variable angle you desire are shown. Variations of the ratchet, toothed and bayonet clamps are shown in Fig. 2 at A, B, C and D respectively. In Fig. 3 is shown the Garage Equipment Co.'s shield with the knurled fastenings at A and B and the winged lock nut at C. In the same illustration may be seen the Cox two-pane shield. This has the winged fastenings at D and E which hold the upper pane in place. The upper fastening is shown in detail at S and D. Either of these shields is up to date and should suit you.

### Adjusting the Rayfield Carbureter

Editor THE AUTOMOBILE:—Would you kindly tell me how to cure the trouble I am having with my car? The carbureter is out of adjustment and I cannot get the motor to pull at all speeds. It runs well at one speed but at another will balk and miss terribly. I am at a loss to know what to do to bring the carbureter back into adjustment. The make of the carbureter is a Rayfield. If you could publish an illustration showing the adjustment points on the carbureter it would help considerably in getting things straight.

New York City.

HARRY VOGEL.

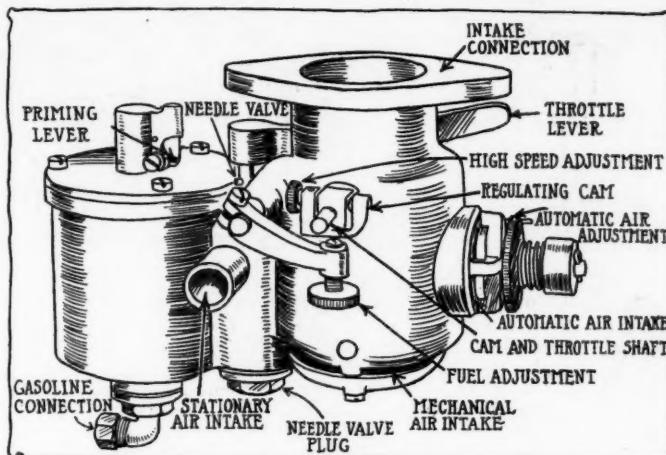


Fig. 4—Points of adjustment on the Rayfield carbureter

—To make the adjustments on the Rayfield the following method of procedure is observed:

First close the needle valve. This is done by turning the fuel adjustment to the left until the screw leaves contact with the regulating cam, which indicates that the needle valve is seated. Then turn the fuel adjustment screw to the right for about one and one-quarter turns. The motor may now be started.

For more fuel turn the fuel adjustment screw to the right and to decrease the supply turn it to the left. This adjustment can only be made at retard or low throttle. Having found the right fuel supply for running slowly, open the throttle. If backfiring occurs, turn the high speed adjusting screw to the right, which increases the supply of fuel at open throttle. To decrease the fuel supply at high speeds turn the high speed adjusting screw to the left. For adjusting the throttle opening use a screwdriver to turn the screw in the stop arm.

After the right fuel supply has been found for both low and high speeds the throttle should be opened slowly. If backfiring should occur between low and high speed turn the automatic air adjustment to the left. This increases the tension on the springs which control the automatic air valve. The automatic air valve adjustment disk is generally set so that the large spring on the automatic valve has about 1-16-inch play between the adjusting disk and the cap.

After the above adjustments are made, in order to prove that you have proper fuel supply, press with the finger on the automatic air valve, allowing the motor to draw in surplus air. If motor speeds up this indicates that you should use a leaner mixture or that you are not getting enough air. The automatic air valve adjustment disk should be turned to the right until the motor begins to reduce speed or backfires. Then turn the disk back again to the right until the motor runs smoothly. This should be done with throttle about one-eighth open.

### Wants A. L. A. M. Rating of Motors

Editor THE AUTOMOBILE:—Please advise us through the columns of the Rostrum the A. L. A. M. rating of a Buick motor model 25-1913, also Rutenber motor 3.75 by 4.25.

Walkerton, Ind.

B. I. HOLSER.

—The A. L. A. M. rating of the Buick 25 is 22.5 horsepower and of the Rutenber it is also 22.5 horsepower. Since both these motors have the same bore they have the same rating, as the A. L. A. M. formula does not include stroke.

### Please Sign Your Inquiries

The Editor of the Rostrum is in receipt of several letters which offer no clue to the identity of the sender because they are signed Subscriber, Reader, by initials or *nom de plume*. These letters are held and will be published as soon as the senders identify them. If your letter is among these you can have it published by writing this office describing the letter.

**O**HIO Falls Plant Sold.—Following a receivership suit of Ferdinand Kahler, president of the Ohio Falls Motor Co. in New Albany, Ind., against the company to recover \$2,800 on a note for supplies furnished, the plant of the concern was disposed of at receiver's sale on July 7 by John Burns, receiver. O. E. South, treasurer of the company, bid in the property at \$40,545.69. The purchaser paid \$15,000 in cash and assumes liens amounting to \$25,545.67, including a mortgage of \$22,825, together with street and sewer assessments and taxes. Mr. South represents in the purchase a new company which is in the process of organization to take over the plant and operate it on a more extensive scale than ever.

Property that changed hands at the receiver's sale consisted of the plant of the Ohio Falls Motor Co. in Vincennes street, including 6 acres of ground and a half dozen buildings; the machinery, equipment and stock. It is the intention of the new company to devote the plant to the manufacture of an inexpensive runabout. It is expected that the operation of the plant will be resumed within a short time. The name of the new concern has not yet been selected. A meeting of the stockholders will be held in a few days to complete the reorganization.

Two years ago the American Automobile Manufacturing Co. which planned to place the Jontz car on the market, was organized at New Albany and the concern purchased the plant of the old New Albany Woolen Mills Co. that had been idle for a number of years, to convert it into an automobile manufacturing plant.

The capital stock of the company was placed at \$900,000 and quite a large amount of stock was sold. The enterprise was advertised extensively in magazines and it is said purchasers of stock came from every state. Later the company was reorganized under the name of the American Automobile Corp., and a year ago a third reorganization was effected.

**Apperson Taking Bids.**—The Apperson Automobile Co., Kokomo, Ind., is taking bids for the erection of a three-story factory building to cost \$20,000.

**Fiat Adds a Story.**—The Fiat company is adding a second story to its plant in Poughkeepsie, N. Y. The enlargement will increase its floor space about 100,000 square feet.

**Briggs Adds a Building.**—The Briggs-Detroiter Co., Detroit, automobile manufacturer, has begun work on a one-story addition to its plant, to house its service and shipping departments.

**Hartford Foundry in Receiver's Hands.**—The plant of the Hartford Foundry Co., which went into receiver's hands a few days ago has been closed until the affairs of the company can be so arranged as to warrant resumption of operations.

**Hans Has Started Work.**—The Hans Motor Equipment Co., La Crosse, Wis., advises it has started work on a concrete and steel factory with sawtooth roof, one floor and 25,000 square feet of floor space. The structure is to be completed in October.

**Akron Reflector's New Plant.**—The Akron Reflector Co., Akron, O., has made arrangements for the erection of a glass factory in Clarksburg, W. Va. The building will be of steel and concrete, 60 by 130 feet. The company manufactures automobile lights.

**Keeton Plans Addition.**—Work has been started on the first of a series of additions to the plant of the Keeton Motor Co., Detroit. The new building will be one story, 60 by 100 feet, and will be used as a testing shop. Other new buildings will be erected in the near future.

**Overland Men Return to Work.**—The 6,000 employees of the Willys-Overland and Kinsey Mfg. Co., Toledo, O., will go back to work after a brief shut-down on July 21. The many improvements, including new additions and the brick testing track, are well under way.

**McGraw Seeks Aid.**—E. C. McGraw, president of the McGraw Rubber Works, East Palestine, O., is considering the

construction of a four-story automobile tire factory employing 1,500 men, and seeks a preferred stock issue by citizens of East Palestine to assist him in his plans.

**Klumb Company Builds Addition.**—The Klumb Engine & Machine Company, Sheboygan, Wis., is erecting three new buildings, a machine shop, pattern works and power house. The company was organized several months ago by Paul Klumb, for many years secretary of the Globe Foundry & Machine Company.

**Page Buys Chevrolet Building.**—The Page-Detroit Motor Car Co., Detroit, has purchased the large factory building on the Grand boulevard, formerly occupied by the Chevrolet Motor Co., and will utilize it for the manufacture of motors exclusively. The building is 150 by 325 feet, and will be three stories in height.

**Sun-Lite Acetylene Tank.**—The Gas Tank Recharging Company of Milwaukee has established offices and service station at 256 Fifth street and will make a bid for acetylene gas tank business. The company has adopted "Sun-Lite" as a trademark. John J. McJesky is president and Fred J. Pagels is secretary and treasurer. The corporation is capitalized at \$25,000.

**Rauch & Lang to Increase.**—Large additions to the factory of the Rauch & Lang Carriage Co., Cleveland, O., are to be made at once, giving the company 78,000 square feet of additional floor space. The new building will be of brick and steel, 112 by 199 feet, and will strengthen the company's claim to being the largest manufacturer of electric vehicles in the world.

**Trucks Help Overcome Strike.**—New Orleans manufacturers are highly pleased with the immunity that they feel from the effects of strikes on the belt railway. During the troubles which have just been settled, motor trucks were used to such an advantage that little delay or loss was experienced. As there is a possibility of further trouble, several companies are buying trucks.

**Watertown Iron Factory.**—The project of establishing a large malleable iron foundry at Watertown, Wis., has been revived after lying idle for 8 months. It is the intention to form a \$100,000 corporation and establish a foundry producing about 42,500 tons a year. A public meeting is scheduled for July 18 to discuss the proposition. E. J. Vanderboom, E. Ward and H. Kreitner, of Milwaukee, are assisting in the promotion of the enterprise.

**Change of Name.**—The American Gas Engineering Company, Sheboygan, Wis., organized early this year with \$50,000 capital to manufacture gasoline engines and machinery, has changed its name to Universal Oxygen Company and will devote most of its attention to the cutting and welding business by the oxy-acetylene process. A plant is being erected at South Fourteenth street and the Sheboygan river, which will include an extensive department for the care of motor car business.

**Remy Reports Activity.**—It is reported that the Remy Electric Co. has orders booked ahead for 87,000 starters. The Studebaker company will be one of the large consumers of the Remy products this season. Several departments of the plant are working nights now. Mr. Atwood, the new factory manager, has arrived and is in charge of the mechanical work of the plant. He will have an assistant who is to remain in Anderson all of the time in active charge of the construction work. The plant is preparing for the biggest run in its history. Last year during the active season the plant employed nearly 1,000 men. It is said that the number of men employed will reach 1,500 this year.

**Moline Enlarges Machine Department.**—One of the most successful seasons in its history has just been closed by the Moline Automobile Co., manufacturers of the Dreadnaught Moline. Owing to the increase of business they have been compelled to make an addition to the motor building machine department. This enlargement is requested to house the additional automatic machines which they are now installing. The new building, a one story structure, lighted with sky lights, gives 6400 feet of added floor space. Work is being pushed at the highest possible speed in order that the increased room may be employed at the earliest possible moment.

**To Add to Saurer Truck Plant**—A tract of land adjoining the Saurer truck plant at Plainfield, N. J., has been purchased by the International Motor Co., which will erect an addition to the plant.

**Ohio Falls Plant Sold**—The plant of the Ohio Falls Motor Co., New Albany, Ind., has been sold by the receiver to O. E. South, treasurer of the concern. The consideration was \$45,000. Mr. South expects to organize a new company immediately, which will have an authorized capitalization of \$200,000. A medium-priced runabout will be manufactured.

**No Car Factory in Argentine**.—An effort to promote an automobile manufacturing company in Buenos Aires has failed. Prospective stockholders in the company financed an investigation of the plan and were convinced that cars manufactured there, at such a distance from the centers of supply, could not compete with cars made in other countries.

**Maxim Tricar Buys Only Factory**—The Maxim Tricar Mfg. Co., builder of three-wheeled delivery wagons, has purchased the plant of the Only Car Co., lately bankrupt, at Jefferson, L. I. The factory at Thompsonville, Conn., has been discontinued. Otto Kuhneman has resigned the office of secretary and Vincent King that of treasurer. Victor I. Logo has assumed the duties of both.

**Body Company Ready for Work**—The Commercial Auto Body Mfg. Co., Cleveland, O., which was incorporated in June with a capital of \$50,000, has finished equipping its plant at 5345 St. Clair avenue. Truck and other specially designed bodies are an important part of the company's work, although painting, top and upholstering, blacksmithing and motor repair departments are maintained. The plant is in charge of J. J. McElliott, superintendent, and N. P. Larsen, manager. Lawrence S. Fuller, treasurer, has charge of the office and financial affairs. F. L. Fuller is president and J. S. Fuller vice-president.

**Ford Buys Site in Houston**—Consummation of the deal in which the Ford Motor Car Co. has purchased a factory site at Houston, Tex., on which to erect a large automobile assembling plant was completed in its final detail recently, when a record was filed with the County Clerk of Harris County of the transfer of 5 1-3 acres.

The property was bought from John Young of Galveston through W. J. Way and L. W. Craig & Son of Houston. The purchase price was \$25,000. The property extends from the Harrisburg road to the Galveston, Houston and Henderson Railroad, fronting 500 feet on the Harrisburg Road by 475 feet in depth, and lies a block east of Milby street.

The company contemplates erecting a five-story reinforced concrete plant, the building contract for which, according to Mr. Jones, will be let within the next four or so weeks. The building will be thoroughly fireproof and will cover a ground area of 125 by 300 feet, to be increased as the needs develop. According to Mr. Jones the plant will ultimately employ a force of from 300 to 400 skilled workmen. The building will be located at the western corner of the property.

E. C. Webster, the architect of the Ford Motor Car Co., has been in Houston and inspected the building site and has returned to the home office of the company at Detroit, where he will have the plans and specifications drawn immediately. It is expected that he will return to the Houston office of the company within about a month, when the plans will be submitted to contractors for bids, after which the construction of the plant will be begun as soon as possible and the work rushed to completion.



#### Shows, Conventions, Etc.

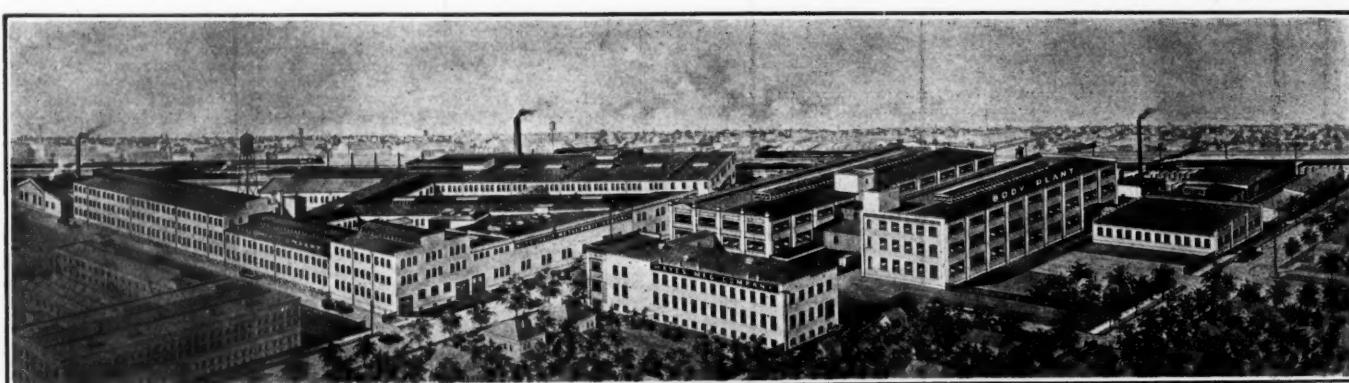
October 13.....Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.  
Oct. 27-28.....Chicago, Ill., Convention of Electric Vehicle Association of America.  
December 9-12.....Philadelphia, Pa., Annual Convention of American Road Builders' Association.  
Dec. 11-20.....New York City, First International Exposition of Safety and Sanitation, under the auspices of the American Museum of Safety.

#### Race Meets, Runs, Hill Climbs, Etc.

July 17.....St. Joseph, Mo., Track Meeting, J. A. Sloan.  
July 18-19.....Peoria, Ill., Track Meeting, Automobile Club of Peoria.  
July 20.....Tulsa, Ariz., Track Races, Tulsa Automobile Club.  
July 21-25.....Grand Rapids, Mich., Automobile Club Tour.  
July 26.....Orangeburg, N. Y., Track Meeting, Rockland County Fair Assn.  
July 26-31.....San Antonio, Tex., Tour, San Antonio Automobile Club.  
July 27-28.....Tacoma, Wash., Tacoma Road Races.  
July 28-29-30.....Galveston, Tex., Beach Races, Galveston Automobile Club.  
July 29-31.....Lincoln, Neb., Reliability Run, Lincoln Automobile Club.  
July 31.....Philadelphia, Penn., Truck Parade, *Philadelphia Inquirer*.  
August .....Des Moines, Iowa, Reliability Run, Iowa State Automobile Assn.  
Aug. 5.....Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.  
Aug. 9.....Santa Monica, Cal., Road Race, Santa Monica Road Race Committee.  
Aug. 12.....Kansas City, Mo., Reliability Tour, Kansas State Automobile Assn.  
Aug. 18-20.....Milwaukee, Wis., Fourth Annual Wisconsin Reliability Tour, under the auspices of the Wisconsin State Automobile Assn.  
Aug. 25-30.....Cleveland, O., Midsummer Show, Forest City Fair, Cleveland Automobile Show Co.  
Aug. 29-30.....Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.  
Aug. 30-Sept. 6.....Chicago, Ill., Reliability Run, Chicago Motor Club.  
Sept. 1.....Columbus, O., 200-Mile Track Race, Columbus Automobile Club.  
Sept. 8-15.....Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.  
Sept. 9.....Corona, Cal., Track Race, Corona Automobile Assn.  
Sept. 12.....Canfield, O., Track Meeting, Canfield Fair Assn.  
Sept. 13.....Covington, Ky., Track Meeting, Cincinnati Automobile Club.  
Sept. 13.....Grand Rapids, Mich., Track Races, Grand Rapids Automobile Club.  
Sept. 20-21.....Detroit, Mich., Track Races, Michigan State Fair.  
Nov. 6.....Phoenix, Ariz., Track Meeting, State Fair.  
Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.  
Nov. 27.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

#### Foreign.

July 15-30.....London, Eng., Olympia Heavy Motor Vehicle Show.  
July 18-26.....London, Eng., Imperial Motor Transport Conference.  
Aug. 28-30.....Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.  
Sept. 21.....Boulogne, France, 3-Litre Race.  
Sept. 25.....Isle of Man, International Stock Car Race.  
October 17-28.....Paris, France, Automobile Show, Grand Palais, 10 days.  
November .....London, Eng., Annual Automobile Exhibition, Olympia.



Bird's-eye view of the big plant of the Hayes Mfg. Co., Detroit, Mich. This company manufactures a large part of the bodies used by Detroit automobile makers

# The Week in the Industry

## Engineer Dealer Repairman Garage

**B**UY'S FOUR TONS OF TIRES—The O. K. Vulcanizing Works, Binghamton, N. Y., has just bought from the Miller Rubber Co., Akron, O., 8,000 pounds of tires. The O. K. concern represents the Miller company in the southern part of New York state, excepting the metropolitan district, and it has also equipped a service plant where tires can be put in condition.

In the article on the Norwalk car which appeared in *THE AUTOMOBILE* of July 10, the interior view was captioned top view and vice versa.

**ANOTHER CINCINNATI GARAGE**—Walter Reimann, now in the hardware business in Cincinnati, O., will build a one-story garage in that city.

**GUARANTEED AUTOMOBILE REPAIRS**—J. M. McDade, an expert mechanician and repair man, has opened a repair shop in Houston, Tex., and will turn out guaranteed repair work.

**JOHNS-MANVILLE CHARLOTTE BRANCH**—The H. W. Johns-Manville Co., has opened a branch office at Charlotte, N. C. The office is located in the Commercial Bank Building and E. U. Heslop has charge of it.

**POPE-HARTFORD POLICE PATROL**—Hartford, Conn., has purchased a new Pope-Hartford, chain-driven police patrol, which goes into service in a few days. All previous models have been shaft-driven.

The automobile associations will see that the roads are properly oiled hereafter and also will endeavor to have a city ordinance passed that will prohibit the use of the electric light within the city limits.

**NEW GARAGE FOR ERIE, PA.**—The contract for erecting the one-story brick and steel garage of the Wayne Brewing Co., Erie, Pa., has been awarded to the Henry Shenk Co., the cost of the new building being \$12,000.

**BAKER BUYS SHAFER GARAGE**—M. N. Baker recently bought the garage which was formerly owned by T. L. Shaper, Goliah, Tex., and he contemplates moving the building to his lots on Fannin street, in that city.

**WALKER WITH HARTFORD AUTO PARTS**—F. George Walker, who formerly was on the sales force of the Oldsmobile and Garford companies, has joined the Hartford Auto Parts Co., Hartford, Conn., as sales manager and service engineer.

**NEW GARAGE FOR CINCINNATI**—The Queen City Motor Delivery Co. is going to put up a large garage in Cincinnati, O., which will be located at the corner of Second and Plum streets. The president of the company is Albert Heheman.

**CITIES PROTECT TIRES**—At the request of the automobile clubs several Alabama cities have passed ordinances making it unlawful to place in the streets any article that will be injurious to automobile tires. A fine of \$25 to \$100 is provided.

**BRICK AND GLASS GARAGE**—A brick and glass garage is being built in Plainview, Tex., by Ellerd Bros., agent for Franklin cars. The garage is between the present Ellerd building and store and the Majestic theatre. It covers a lot of 24 by 100 feet.

**G. M. T.'S NEW PHILADELPHIA BUILDING**—The General Motors Truck Co.'s Philadelphia branch is preparing plans for a new two-story showroom and office building, covering a lot of 22 by 90 feet at the corner of Nineteenth and Arch streets.

The powerful electric headlights which throw their rays a distance of 1,000 feet or more, blind a motorist coming in the opposite direction, and cause him to either stop his car, creep along at snail's pace or otherwise take chance of going into a ditch.

**SELLS PACKARD 16 YEARS OLD**—The first automobile to be owned in San Angelo, Tex., was sold last week for \$5. It is a Packard, purchased 16 years ago. It was the first automobile seen west of San Antonio and attracted hundreds of persons from the entire countryside.

**MISSOURI GARAGE FOR FORTY CARS**—The P. M. Garage, Jefferson City, Mo., has been enlarged to have a capacity for forty cars, which is a record size in this section of the country. The extension includes an enlargement in width of 15 feet and a total depth of 168 feet.

**MOYER WITH GENERAL RIM**—P. Hughes Moyer, formerly chief engineer of the Firestone company's rim factory at Akron, O., is now chief engineer of the General Rim Co., Cleveland, O., where a manufacturing plant and headquarters of the latter company have been opened.

**NEW PHILADELPHIA GARAGE**—A new garage has been erected on the old Anthony Beneyet property, opposite the Hotel Bellevue, near the city of Philadelphia, by the D. S. K. Auto Supply Co., of that city. The garage is located on the road leading to Wildwood and Cape May City.

**CORRECTIONS OF ERRORS**—In the article on "Overloading Ruins Solid Truck Tires" which appeared in the June 26 issue of *THE AUTOMOBILE*, the carrying capacity of a Goodrich 3-inch single tire was given as 590 pounds, due to a typographical error. The real capacity is 950 pounds.

**PACKARD SELLS KANSAS CITY HOME**—The building formerly used by the Packard Motor Car Co. for its Kansas City, Mo., business has been sold to the Delaware Street Land Co., together with a 99-year lease, for the total sum of \$32,000. The building is two stories high and constructed of reinforced concrete.

**MUST BURY TANKS**—A disastrous fire in a garage at Greenville, Miss., in which a number of automobiles were burned and other valuable property destroyed, may result in a state law making necessary the burying of gasoline supply tanks. A bill has been drafted and will be presented at the next meeting of the legislature.

**MUNSON PHILADELPHIA SPLITDORF MANAGER**—Charles C. Munson, who for many years was assistant manager for the Witherbee Igniter Co., New York City, has been appointed manager of the Philadelphia branch and service station of the Splitdorf Electrical Co., New York, located at 210 North Thirteenth street, Philadelphia, Pa.

**SAN ANTONIO BUYS TRUCKS**—With the view of improving the service of the fire department, the City of San Antonio, Tex., has under consideration the purchase of five new motor fire trucks. The police department is

to be provided with an automobile patrol wagon and a motor car for the use of the chief and the detectives.

**OSKALOOSA GETS GARAGE**—Oskaloosa, Ia., is going to have a new garage. A building which used to serve Joseph Jones, 217 First avenue, as a carriage repair shop, will be remodeled and made into an annex of the Schee garage or of the place of the Oskaloosa Motor Car Co. The space covered by the garage will be 80 by 120 feet.

**BRONNER LEAVES TRADE**—Harry M. Bronner, who was formerly manager of the Stoddard Dayton Company in New York and later connected with the Edwards Motor Car Co., has tendered his resignation as an officer and member of the Automobile Dealers' Association for the reason that he has severed his connection with the automobile industry.

**HOOSIERS CAN ALWAYS WIRE COLLECT**—Members of the Hoosier Motor Club at Indianapolis have just found another advantage in being members of the club. They have been notified they can send telegrams collect through the Postal Telegraph Cable Co. in any part of the United States, by showing their membership cards in the club.

**DAYTON CONDITIONS NORMAL AGAIN**—According to R. E. Baus, factory manager of the Maxwell Motor Co.'s Dayton, O., plants, conditions in that city are again normal, the effects of the recent flood disasters have been entirely overcome and the city has been improved as a result of this work, while labor conditions are now easy and unstrained.

**LAW HAS COME TO BOSTON**—Fred A. Law, until recently superintendent of the Selden Motor Vehicle Co. at Rochester, N. Y., has returned East and will conduct a general supply agency, with headquarters in Boston. He was formerly identified with the Electric Vehicle Co., having designed the first four-cylinder motor ever built by the company.

**DES MOINES CADILLAC MOVES**—The Cadillac Motor Co. of Des Moines, Ia., has closed a contract for the lease of a site on corner Eleventh and Locust streets. This site is 66 by 132 feet and is the property of Thomas P. McCurnin. The Cadillac company is erecting a modern structure on the lot and will equip it as an up-to-date service department.

**STUTZ HAS ELECTRIC STARTER**—The Stutz Motor Car Co. of Indianapolis will equip its new series of cars with an electric self-starter. This is a starter designed by Harry Stutz, of the company, and is operated by a pedal which throws on the current, simultaneously meshing the gears. It is said the motor may be turned at the rate of 120 revolutions a minute with the starter.

As now applied the oil wagon driver slowly moves his team along the highway with his vents wide open, causing the roadway to be flooded with the crude oil, sometimes an inch deep, and in several instances it was noticed that holes three inches deep were filled with the oil. With the roads in such condition it is argued that a machine can easily skid and cause loss of life and injuries.

**HARTFORD TAXIS HAVE NEW BODIES**—The Capital City Auto Co., one of the first concerns in the city to install taxicabs, has done away with the usual type of cab and substituted open touring cars and town cars. Twenty vehicles of five and seven-passenger capacity have been put into service. A complete tire department and paint shop have been added to the plant. Further extensions are planned for the near future.

**FIRESTONE GIVES WORKERS OUTING**—H. S. Firestone and other officials of the Firestone Tire & Rubber Co., Akron, O., recently gave the workers of the plant an outing and picnic at which all entertainments were gratis to the people. The men were taken to Silver Lake, near the city, without any cost to them. Mr. Firestone has since left for New York and a subsequent trip to Europe, including a tour through France, Switzerland, Germany and Italy.

**ECONOMY COMPANY SEEKS SITE**—The Economy Car Company of Indianapolis is negotiating with several cities with a view to locating its plant elsewhere than Indianapolis. It is said that an attractive offer has been made by Danville, Ill., and the company may decide to locate there. The company, which was organized recently to manufacture cyclecars, is anxious to begin operations, and hopes to be placing cars on the market within the next 30 days.

**MILWAUKEE ORPHANS TO BE TREATED**—The Milwaukee automobile club will hold its seventh annual Orphans' Outing during the latter part of August and expects to entertain more than 500 waifs of the city with a long ride, followed by a picnic luncheon at Washington Park. William H. Pipkorn, originator of the idea of entertaining the orphans once each year, and who has been in charge of these affairs for the past six years, will again act as chairman of the arrangements committee.

**NOTIFICATION OF TRANSFER REQUIRED**—Penalties are to be levied in the future in Shreveport, La., if the registration office is not notified immediately when automobiles change hands. Misconduct with a car led to the arrest of the man in whose name the car was registered. At the hearing it was shown that the car had changed hands twice since the defendant had disposed of it, but no notification was sent the registration office. Both seller and buyer will be held responsible for proper registration.

**MAKES 32.6 MILES ON 1 GALLON**—Homer Motsinger, president of the Motsinger Devices Co., Lafayette, Ind., recently made a carburetor efficiency and economy test of considerable interest. He removed the gasoline tank from a Ford car, replacing it with a 1-gallon container of gasoline, and with this amount of fuel drove 32.6 miles, using a Motsinger device. He believes this establishes a new record, and expects to make a further attempt to drive 35 miles with an equal amount of fuel.

**OBJECT TO OILED ST. LOUIS ROADS**—Since the recent Sommers accident, in which four members of one family were killed and a like number seriously injured, on the Olive street road in the county, prominent automobile people in the city have protested against the improper oiling of roads and the use of the powerful electric headlights which now grace many of the late model cars. It is alleged that this combination is the cause of many accidents and should be remedied at once.

PHILADELPHIA HARDMAN TIRE AGENCY—A Philadelphia agency of the Hardman Tire & Rubber Co., of New York, has been established at No. 1923 Sansom Street, with J. A. McTaggart as manager.

WELLS & CO. HAVE DETROIT PLACE—A. H. Wells & Co., Waterbury, Conn., manufacturer of seamless brass and copper tubing, have recently opened offices in Detroit, at 1311 Dime Savings Bank Building, with Chas. C. Limbocker as representative.

MCCORD TO GO WITH CADILLAC—H. M. McCord, who has acted as local agent for the Cadillac Motor Car Co. at Toledo, has resigned his position and disposed of his interests here. He expects to identify himself with a large Cadillac agency in another State.

JEFFERSON GARAGE, RICHMOND, BANKRUPT—Mercer W. Christian, trading under the firm name of the Jefferson Garage, 11 West Main Street, Richmond, Va., through his attorney, James R. Russell, has filed a petition in voluntary bankruptcy in the U. S. District Court here.

BUSES ON INDIANA ROADS—A motor car bus service has been established between Richmond and Liberty, Ind., which has no railroad connection. The distance is 16 miles, and several round trips will be made each day. Both passengers and light freight are carried. Similar service is to be established soon between Liberty and Brookville.

GOMERY SECRETARY PHILADELPHIA TRADE ASSOCIATION—J. E. Gomery, member of the firm of Gomery-Schwartz Motor Car Co., Philadelphia, Pa., local agency of the Hudson pleasure car and the Stewart truck, has been elected secretary-treasurer of the Philadelphia Automobile Trade Association to fill the vacancy created by the resignation of F. W. Eveland.

NEW CONNECTICUT LAW HAS VICTIMS—Throughout the State of Connecticut the police are active in the enforcement of the new automobile law. Hardly a day passes but a larger number are hauled into court in the larger cities of the State. In many of the smaller towns the constables are active. It is anticipated that after the excitement subsides there will be less of the hold-up tactics.

FINED \$50 FOR KILLING CHILD—A 16-year-old boy was fined \$50 and costs in the New Haven, Conn., police court this week for operating a motor car without a license and for attempting to avoid responsibility. The car driven by the accused struck and killed a child in New Haven. Judge O'Meara, who passed on the case, severely scored parents who allow their children to operate cars.

AUTOMOBILES TOO MANY FOR OMAHA—Automobiles have become so numerous in Omaha, and the practice of leaving them on the streets about office buildings during the day, such an impediment to traffic, that the Associated Retailers of Omaha will, at their monthly banquet to be held soon, take up the question and recommend some solution of this automobile trouble to the City Council.

OLDSMOBILE'S HARD TOURING WORK—Mud-splattered and weather-beaten, a large Oldsmobile, en route from Los Angeles, Cal., to Three Rivers, Mich., reached St. Louis and stopped over for 1 day. The tourists are H. D. Eddy, manager of the Eddy Paper Company, of the Michigan city, and his wife. They have been on the road about 1 month, passing through Grand Canyon and over the Raton Pass at Albuquerque, N. M., reaching an elevation of 8,790 feet.

FREE BUS LINE IN DETROIT—An innovation in progressive department store management has been started by the Elliott-Taylor-Woolfenden Co., of Detroit, which has established a free motor bus line from the Campus Martius, the main traffic center of the city, to the store, one-half mile distant, for the benefit of its patrons. Round trips are made on a 15-minute

schedule during shopping hours. The vehicle is a Packard 2-ton truck chassis equipped with a special bus body.

CHAMBERSBURG-MADE CARS AT GETTYSBURG—It is an interesting fact to know that 90 per cent. of the parts of automobiles that visited Gettysburg during the semi-centennial celebration of the Battle of Gettysburg last week were said to have been forged with hammers made by the Chambersburg Engineering Co., Chambersburg. These parts include crankshafts, connecting rods, axles, frames, gears, hubs, steering knuckles, and pedals and levers.

LOUISVILLE AGAINST HORN NOISES—Official and determined action against the various and disturbing sounds caused by motor vehicles will be instituted by the Louisville Automobile Club within a few days. The organization has already called its executive committee attention to the alarming prevalence of unnecessary noise made by automobiles. Complaints of regular violations of the city ordinance against the use of the muffler cut-out on both motor cars and motorcycles have recently been brought before the club and action toward eliminating these nuisances will be taken at the next meeting of the executive body.

STATE OWNERSHIP OF ROADS AFFIRMED—The decision of the Pennsylvania Supreme Court affirming the constitutionality of the Sproul act and also of the Hoke act relative to highways, which put under State ownership the several connecting turnpikes from the Bedford County line through Fulton, Franklin and Adams Counties, southward to the Maryland line. Formal action was taken this week by the State Highway Department and by agreement of the department and turnpike companies the several turnpikes will be forever free by legal decree. By this action the State becomes the owner of about 75 miles of additional toll roads.

MAY PACKARD RECORD SALES MONTH—Shipments of Packard vehicles during the last 3 months make the largest total for a fiscal quarter ever reached by a concern manufacturing high-grade motor vehicles. In the period mentioned motor carriages and trucks representing a value of \$8,120,000 were delivered to purchasers. The shipments in May were the largest for any one month since the Packard company started in business. April of this year was the highest month up to that time. The Packard also reports a heavy volume of truck sales during the month of June. Sales of the heavy-duty vehicles showed an increase of \$270,000 over the same month of last year.

AUTOMOBILES INCREASE FARM LAND VALUES—Every automobile in service increases the value of farm lands in the country \$2 per acre, according to J. W. Moon, president of the Moon Motor Car Co., who has made an exhaustive study of statistics and who has had a wide experience in digesting statistics on farm machinery. "In spite of the fact that \$300,000,000 is spent annually for automobiles and automobile supplies," says Mr. Moon, "the country banker no longer throws up his hands in horror and calls that enormous expenditure of extravagance. Several years ago the country banker saw his ruin every time one of his farmer clients took money out of his bank to buy an automobile."

MISSOURI WILL HAVE ROAD WORK—In addition to setting aside 2 days next month for the working of roads by citizens throughout the State, Governor Elliott W. Major announced that he would call upon the various county courts of the State to advise road overseers as to the proper preparations for handling the thousands of volunteer workers he expects to answer his call. The executive said he expected at least 500,000 persons would respond for the work. He expects to get out himself and do some work with a pick and shovel, and would like to see every State and county official do likewise.

## Recent Incorporations in the Automobile Field

### AUTOMOBILES AND PARTS

BOWLING GREEN, O.—Modern Motor Car Co.; capital \$1,000. Incorporators: T. E. Moore and others.

CINCINNATI, O.—Commercial Motor Car Co.; capital \$50,000; to deal in motor cars. Incorporators: Walter G. Vossler and others.

DETROIT, MICH.—New Manufacturing Co.; capital \$150,000; to manufacture automobiles. Incorporators: C. W. Jackson, B. W. Denison.

HADDONFIELD, N. J.—Tire Place; capital \$100,000; to manufacture, hold, own and deal in automobiles. Incorporators: John G. Hughes, Harry Fischer, Harry W. Davis.

INDIANAPOLIS, IND.—Auto Drive & Parts Co.; capital \$100,000. Incorporators: J. J. Kelly, L. D. Buentin.

NEW YORK, N. Y.—Packard Auto Exchange Co.; capital \$1,000. Incorporators: Benj. Einstein, John J. Burgess, John S. Farran.

PHILADELPHIA, PA.—Bigelow-Willey Motor Co.; capital \$50,000. Incorporators: J. W. Bigelow, G. A. Willey.

TEXARKANA, ARK.—Southern Motor Co.; capital \$20,000; to manufacture motor trucks. Incorporators: K. M. Kelly, C. J. Neef, Andrew Bowden.

WILMINGTON, DEL.—Brookes Motor Car Co.; capital \$5,000,000; to manufacture, sell and deal in automobiles. Incorporators: Charles B. Bishop, Clarence J. Jacobs, Harry W. Davis.

BUFFALO, N. Y.—Buffalo Auto Accessory Mfg. Co.; capital \$20,000. Incorporators: J. B. McCready, John T. Miller, E. S. McCready.

CLEVELAND, O.—Cleveland Auto Supply Co.; capital \$5,000. Incorporators: W. H. Toepl, A. B. Erdman, Albert Lutze.

CLEVELAND, O.—Commercial Auto Body & Mfg. Co.; capital \$50,000. Incorporators: M. E. McManus, C. H. Knippenberg, F. L. Fuller, J. H. Orgill, J. E. Matthews.

HOUSTON, TEX.—Green Taxicab & Automobile Co.; capital \$15,000. Incorporators: F. W. Crow, E. M. Wiess, W. W. Kyle.

NEW YORK, N. Y.—Ardsley Garage Co.; capital \$60,000. Incorporators: Sigmund Meyer, Max A. Cramer, Joseph Fischer.

NEW YORK, N. Y.—Taxomobile Co.; capital \$1,000. Incorporators: Abraham Snydecker, Anthony G. Ibbeken, Louisa F. Ibbeken.

## New Agencies Established During the Week

### PASSENGER CARS

Place	Car	Agent
Atlanta, Ga.	Oakland	Geo. W. Hanson
Birmingham, Ala.	Herreshoff	Robertson
Boston, Mass.	Marathon	William Sanford
Canton, O.	Franklin	Belden Bros.
Carson, Ia.	Detroiter	Hooker Bros.
Elliott, Ia.	Empire	William Cletes
Freeport, Ill.	Franklin	C. M. Saxby
Gothenburg, Neb.	National	Sandstorm & Anderson
Grand Island, Neb.	Empire	Jarvis & Bauder Co.
Henderson, Ia.	Empire	H. Buck
Lincoln, Neb.	Empire	E. W. Fry
Logan, Ia.	Detroiter	Kennedy Brothers
Minot, N. D.	Franklin	C. C. Nugent
Neligh, Neb.	Detroiter	Daxon Implement Co.
New York City.	Ford	I. Davega, Jr.
Oklahoma City, Okla.	Franklin	W. R. Light

Place	Car	Agent
Philadelphia, Pa.	Minerva	Wm. C. Yerkes
Prince Albert, Sask.	Franklin	Modern Automobile Co.
Somerville, Mass.	Marathon	Armstrong & Curtis
St. Thomas, N. D.	Franklin	Motor Inn
Wahoo, Neb.	Empire	Stratton & Hanson
Washington, D. C.	Stevens-Duryea	T. Lamar Jackson
Wilkes-Barre, Pa.	Franklin	Wm. S. Lee
Wisner, Neb.	Regal	Chris Jensen
Woodbine, Ia.	Empire	Snyder Auto Co.

### COMMERCIAL VEHICLES

Bridgeport, Conn.	Modern	Buckley Motor Car Co.
Cromwell, Conn.	Modern	Cromwell Garage
New Haven, Conn.	Modern	Hotchkiss Motor Co.
Norwalk, Conn.	Modern	F. E. Lockwood & Co.
Torrington, Conn.	Modern	E. B. Pratt

# Accessories for the Automobilist



**S TAR Portable Vulcanizer**—The Star Vulcanizer Mfg. Co., Columbus, O., manufactures the portable steam vulcanizer, Fig. 1. This device consists of a small steam boiler of gray iron tested to withstand 300 pounds pressure per square inch and fitted with a concave surface which fits that of the casing of the tire. In operation, the burner under the boiler is filled with alcohol and the fuel is lit, whereby the water in the boiler is vaporized and circulated to heat the plate contacting with the tire. A gauge shows the pressure of the steam on the device.

**Moore Tire-Saving Jack**—A specially constructed jack, made by the Walker-Moore Mfg. Co., Racine, Wis., and marketed under the name of the Moore tire-saving jack is seen in Fig. 2. It consists of a frame support, a lifting lever and a steel loop attached to the end of the same. The lever is pivoted on the top of the frame and if its long end is depressed, the loop is raised. The return of the lever to its original position is prevented by a drop-pawl device. Four of these jacks may be applied to a car during 1 minute, the operation consisting in the fitting of the loop over the hub cap and lifting of the loop by the lever. The weight of four jacks, sufficient to handle wheels from 32 to 36 inches diameter, is 40 pounds altogether.

**Neverout Garage Type Radiator Heater**—The Rose Mfg. Co., 910 Arch street, Philadelphia, Pa., make a device for preventing the freezing of radiator water during the winter. The accessory is made in a road and a garage type, the latter being shown at Fig 3. It consists of a Bunsen burner which may be connected to a city-gas main or outlet and which is surrounded by screen work, so that inflammable vapors cannot pass away from the burner after having been ignited by the flame. Above the burner, there is a boiler which connects to the radiator drain hole, so that the coldest water—which is at the bottom of the radiator—flows to the boiler, in which it is heated and whence it leaves through the rubber-covered tube attached to the boiler top and which can be hooked with its rounded mouth in the filler hole. The device is perfectly safe and effective.

**Westinghouse Universal Blow Torch**—The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is manufacturing a new blow torch, claimed to be made of the heaviest brass ever used for this purpose and styled the Universal. Fig. 4

shows this device in cross-section. The tank is tight and heavy; the drip cup is deep so as to make starting easy even in bad weather; the air pump is packed around its piston so as to remain reliable and efficient, and the valve mechanism is worked out carefully and with tight fits. The needle valve itself, which serves for regulating the flame, is self-cleaning by its turning movement on the seat, so that mechanical cleaning is not necessary. The valve handle is of fiber which does not heat, crack, loosen or come off. This torch is made in a quart and a pint size.

**Jesco Starter and Lighter**—Jesco starting and lighting systems for 1914 show decided improvement over the original designs. The chief changes have been made in the simplification of installation and control features. So far as the actual design of the motor generator is concerned there is little change, except that the controller, which in the original system was separate from the motor-generator and mounted in the driver's compartment, now is incorporated as a part of the electric unit. Consequently the entire mechanism, with the exception of the battery, now is a unit. This makes the installation of the system very easy and the wiring connection particularly simple.

Another step in the simplification of the system is the adoption of the single-voltage system. The 1914 system operates on 6 volts throughout instead of the 6-volt or 8-volt lighting and 12-volt or 16-volt cranking used in the earlier design.

Simplicity of wiring connections is shown in Fig. 7. A view of the complete unit is seen in Fig. 5, which shows the controller and switch box mounted as a unit with the motor generator. A feature which makes installation on different cars easy is the fact that the rings carrying the plugs for attaching the unit may be rotated about the unit and placed in any one of four positions. This permits the unit to be mounted upright, upside down or sideways as conditions may require.

The driving gears and the automatic clutch is incorporated with the starting and lighting unit so that no special arrangements are required. The generator is of the multipolar type, having special field windings that are in service as the starter is acting as a motor or as a generator. When the generator is acting as a motor, a gear transmission in the front of the case is engaged which increases the gear ratio between the armature of the generator and the crankshaft of the engine, increasing the cranking torque.

When the engine is running, the gear transmission is locked by the action of a centrifugally actuated multiple-disk clutch, then the generator armature, Fig. 6, as a gear ratio of 2 or 3 to 1 with the crankshaft. No gears are in operation when running as a generator.

Changing from motor to generator automatically is taken care of in the controller. The generator charges the battery, which is a Willard, 6-80, at a car speed between 8 and 10 miles per hour. Below that speed there is a slight draw on the battery for the lights; above that speed the generator will carry the lights and also charge the battery. Tests made by the Jones Electric Starter Co., Chicago, the maker of the system, show that 1.1875 horsepower is required by the system

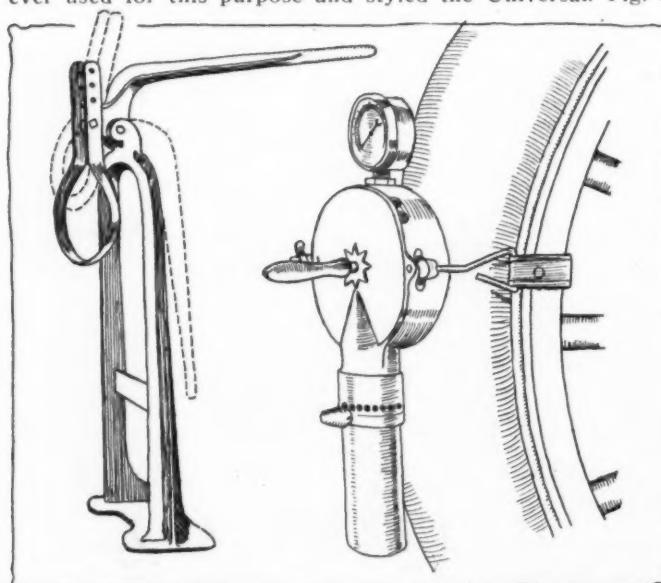


Fig. 1—Moore jack. Fig. 2—Star portable steam vulcanizer

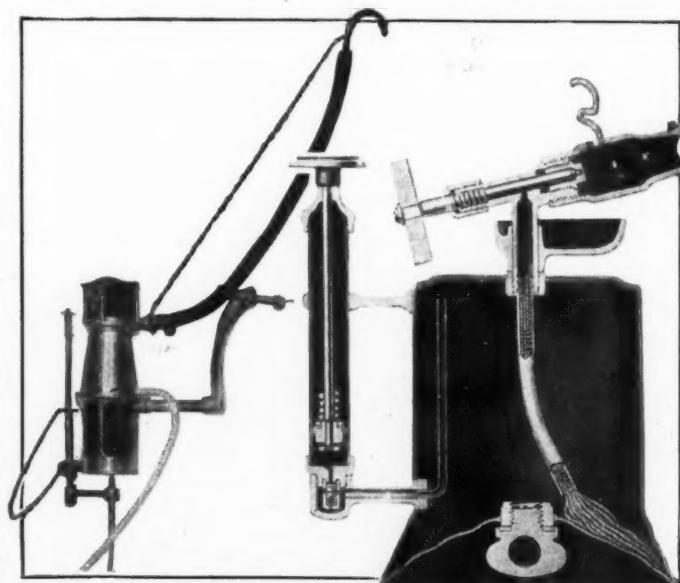


Fig. 3—Neverout radiator heater. Fig. 4—Westinghouse torch

# Index to Automobile Manufacturers Who Have Contracted for



## Storage Batteries

<b>A</b>	Abbott Motor Co. .... Detroit, Mich. Adams-Lancia Co. .... New York City. Allen Motor Car Co. .... Fostoria, Ohio. Alpens Motor Car Co. .... Alpens, Mich. American La France Fire Engine Co. .... Elmira, N. Y. American Locomotive Co. .... Providence, R. I. American Motors Co. .... Indianapolis, Ind. Ames Motor Car Co. .... Owensboro, Ky. Apperson Bros. Automobile Co. .... Kokomo, Ind. O. Armleder Company. .... Cincinnati, Ohio. Auburn Automobile Co. .... Auburn, Ind. Austin Automobile Co. .... Grand Rapids, Mich. Avery Company, The. .... Peoria, Ill.	<b>M</b>	W. H. McIntyre Company. .... Auburn, Ind. McLaughlin Motor Car Co. .... Oshawa, Ont. Marathon Motor Co. .... Nashville, Tenn. Marion Motor Car Co. .... Indianapolis, Ind. Maritime Motor Car Co., Ltd. .... St. John, N. B. Martindale & Millikan. .... Franklin, Ind. Maxwell Motor Car Co. .... Detroit, Mich. Mercer Automobile Co. .... Trenton, N. J. Metzger Motor Car Co. .... Detroit, Mich. Michigan Buggy Co. .... Kalamazoo, Mich. Midland Motor Car Co. .... Moline, Ill. Mitchell-Lewis Motor Car Co. .... Racine, Wis. Moline Automobile Co. .... East Moline, Ill. Moon Motor Car Co. .... St. Louis, Mo. Motor Car Manufacturing Co. .... Indianapolis, Ind.
<b>B</b>	Bartholomew Company. .... Peoria, Ill. Benton Motor Car Co. .... Benton, Ill. Buckeye Manufacturing Co. .... Anderson, Ind.	<b>N</b>	Nance Motor Car Co. .... Philadelphia, Pa. National Motor Vehicle Co. .... Indianapolis, Ind. Nordyke & Marmon Co. .... Indianapolis, Ind. Norwalk Motor Car Co. .... Martinsburg, W. Va. Nova Scotia Carriage Co. .... Kentville, N. S. Nyberg Automobile Works. .... Anderson, Ind.
<b>C</b>	Canadian Standard Auto & Tract. Co. Fort Wayne, Ind. Cartercar Company. .... Pontiac, Mich. J. I. Case T. M. Machine Works. .... Racine Junct., Wis. Chadwick Engineering Works. .... Pottstown, Pa. Chandler Motor Car Co. .... Cleveland, Ohio. F. Coleman Carriage & Harness Co. .... Ilion, N. Y. Columbus Buggy Company. .... Columbus, Ohio. Commerce Motor Truck Co. .... Detroit, Mich. Corbitt Automobile Co. .... Henderson, N. C. Crane Motor Car Co. .... Bayonne, N. J. Crawford Automobile Co. .... Hagerstown, Md. Crescent Motor Company. .... Cincinnati, Ohio. Crow Motor Car Co. .... Elkhart, Ind. James Cunningham, Son & Co. .... Rochester, N. Y. Cutting Motor Car Co. .... Jackson, Mich. Croxton Motor Car Co. .... Washington, Pa.	<b>O</b>	Oakland Motor Car Co. .... Pontiac, Mich.
<b>D</b>	Geo. W. Davis Carriage Co. .... Richmond, Ind. Di Dion Bouton. .... New York City. Dorris Motor Car Co. .... St. Louis, Mo.	<b>P</b>	Packard Motor Car Co. .... Detroit, Mich. Paige-Detroit Motor Car Co. .... Detroit, Mich. Palmer & Singer Manufacturing Co. .... Long Island City, N. Y. Patterson Wagon Works. .... Flint, Mich. Peerless Motor Car Co. .... Cleveland, Ohio. Pilot Motor Car Co. .... Richmond, Ind. Pope Manufacturing Co. .... Hartford, Conn. Premier Motor Car Co. .... Indianapolis, Ind. Pullman Motor Car Co. .... York, Pa.
<b>E</b>	Enger Motor Car Co. .... Cincinnati, Ohio. Elkhart Carriage & Harness Co. .... Elkhart, Ind.	<b>R</b>	Regal Motor Car Co. .... Detroit, Mich. Renault-Frerers Selling Co. .... New York City. Reo Motor Car Co. .... Lansing, Mich. Reo Motor Car Co. of Canada. .... St. Catharines, Ont. Russell Motor Car Co. .... West Toronto, Ont.
<b>F</b>	F.I.A.T. Company. .... Poughkeepsie, N. Y. Flanders Motor Co. .... Detroit, Mich. H. H. Franklin Manufacturing Co. .... Syracuse, N. Y.	<b>S</b>	Sayers & Scovill Co. .... Cincinnati, Ohio. Schacht Motor Car Co. .... Cincinnati, Ohio. Seagrave Company. .... Columbus, Ohio. Selden Motor Car Co. .... Rochester, N. Y. Simplex Automobile Co. .... New Brunswick, N. J. A. O. Smith Company. .... Milwaukee, Wis. South Bend Motor Car Works. .... South Bend, Ind. Spaulding Manufacturing Co. .... Grinnell, Iowa. Speedwell Motor Car Co. .... Dayton, Ohio. Stanley Motor Car Co. .... Newton, Mass. Staver Carriage Co. .... Chicago, Ill. F. B. Stearns Co. .... Cleveland, Ohio. Stegeman Motor Car Co. .... Milwaukee, Wis. Sternberg Manufacturing Co. .... Milwaukee, Wis. Stevens Duryea Co. .... Chicopee Falls, Mass. Stoddard Dayton Co. (Maxwell). .... Dayton, Ohio. Studebaker Corporation. .... Detroit, Mich.
<b>G</b>	Gramm Bernstein Company. .... Lima, Ohio. Gramm Motor Truck Co. .... Lima, Ohio. Gramm Motor Truck Co. .... Walkerville, Ont. Great Western Automobile Co. .... Peru, Ind.	<b>T</b>	Tudhope Motor Car Co. .... Orillia, Canada.
<b>H</b>	Havers Motor Car Co. .... Port Huron, Mich. Haynes Automobile Co. .... Kokomo, Ind. Henderson Motor Car Co. .... Indianapolis, Ind. Herreshoff Motor Co. .... Detroit, Mich.	<b>V</b>	Vandewater & Company. .... Elizabeth, N. J. Veile Motor Vehicle Co. .... Moline, Ill.
<b>I</b>	Ideal Motor Car Co. .... Indianapolis, Ind. Imperial Automobile Co. .... Jackson, Mich.	<b>W</b>	Warren Motor Car Co. .... Detroit, Mich. Wayne Works. .... Richmond, Ind. Webb Company. .... Allentown, Pa. Westcott Motor Car Co. .... Richmond, Ind. White Company. .... Cleveland, Ohio. Wichita Falls Motor Co. .... Wichita Falls, Tex. Willys Overland Co. .... Toledo, Ohio. Winton Motor Car Co. .... Cleveland, Ohio.
<b>J</b>	Jackson Motor Car Co. .... Jackson, Mich.	<b>Z</b>	Zimmerman Manufacturing Co. .... Auburn, Ind.
<b>K</b>	Kelly-Springfield Motor Truck Co. .... Springfield, Ohio. King Motor Car Co. .... Detroit, Mich. Kissel Motor Car Co. .... Hartford, Wis. Kline Motor Car Co. .... Richmond, Va. Knox Automobile Co. .... Springfield, Mass. Krit Motor Car Co. .... Detroit, Mich.		
<b>L</b>	Lenox Motor Car Co. .... Boston, Mass. Lexington Motor Car Co. .... Connersville, Ind. Little Motor Car Company. .... Flint, Mich. Locomobile Co. of America. .... Bridgeport, Conn. Lozier Motor Car Company. .... Detroit, Mich. Lyons Atlas Company. .... Indianapolis, Ind.		

**WILLARD STORAGE BATTERY CO.  
CLEVELAND, OHIO**

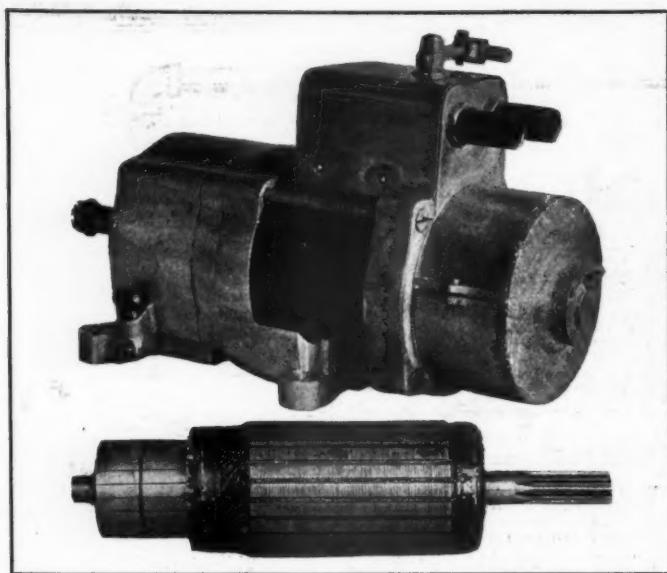


Fig. 5—Jesco starter assembly. Fig. 6—Armature

in order to charge the battery cells at a rate of 12 amperes.

The new outfit weighs about 44 pounds, which is the same weight as the motor-generator alone of the former design. The unit is designed to be mounted on the engine and driven either by a silent chain or gears from the crankshaft. In some cases it may be mounted on the gearset housing and driven from the transmission shafting.

**Walker Two-Fuel Carbureter**—The O. S. W. Co. Worcester, Mass., makes the Walker Quadruplex Carbureter, Fig. 8, which is so constructed that at any time either gasoline or kerosene may be used for running the motor. The carbureter really consists of two carbureters, one A, for kerosene and the other B, for gasoline. The latter is equipped with the ordinary adjustment devices. Both are operated by the same throttle T, but in addition to the latter there is a fuel control device F, which shuts off the communication between either the gasoline or the kerosene carbureter and the intake manifold. The gasoline is connected to a small gasoline tank in the ordinary manner, while the kerosene is supplied through a coiled copper tube C, which is laid around the outlet of the exhaust pipe, which outlet is downward and surrounded by a hot-air box H, from which heated air is conducted to a jacket laid around the mixing chamber

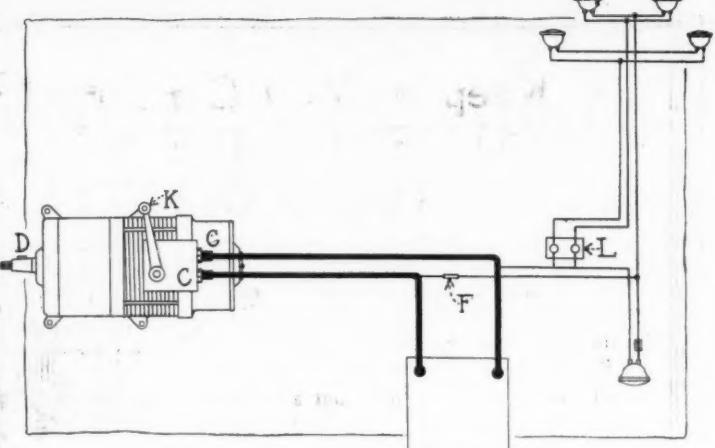


Fig. 7—Jesco starter and lighter's wiring diagram

of carbureter A. Further heating is provided through the deflection of a portion of the exhaust gases passed through pipe E, which passes through the intake manifold. Consequently, the Walker carbureter is easiest installed in motors having both manifolds on one side of the motor. The manufacturer claims that the carbureter is also adapted for using denatured alcohol, and that in tests it has been operated at .625 cent per mile, this being the fuel cost only.

**Hampton Kerosene Carbureter**—Another kerosene carbureter, Fig. 9, has been evolved by the Hampton Carbureter Co., New York City. This device uses gasoline or kerosene, in which latter case the fuel is mixed with water. There are two float chambers, one for each fuel, and one nozzle are likewise used. The kerosene enters at K, while gasoline is admitted through G, and water enters a small float chamber at W. A jacket through which exhaust air flows, entering at E, surrounds the kerosene chamber, and the exhaust gas leaves through O. Both needles are connected to the control mechanism, which is operated from the driver's seat and which opens either the passage from the gasoline chamber to the nozzle or from the kerosene and water chambers. In starting, gasoline is used and only after the motor has been heated somewhat, the kerosene is turned on. When this is done, the water, too, is turned on and mixed with the fuel, producing a spray emerging from the nozzle N. This spray when passing through the outlet pipe of the carbureter is heated and thoroughly vaporized. Great claims are made for the mixture of air, kerosene and water.

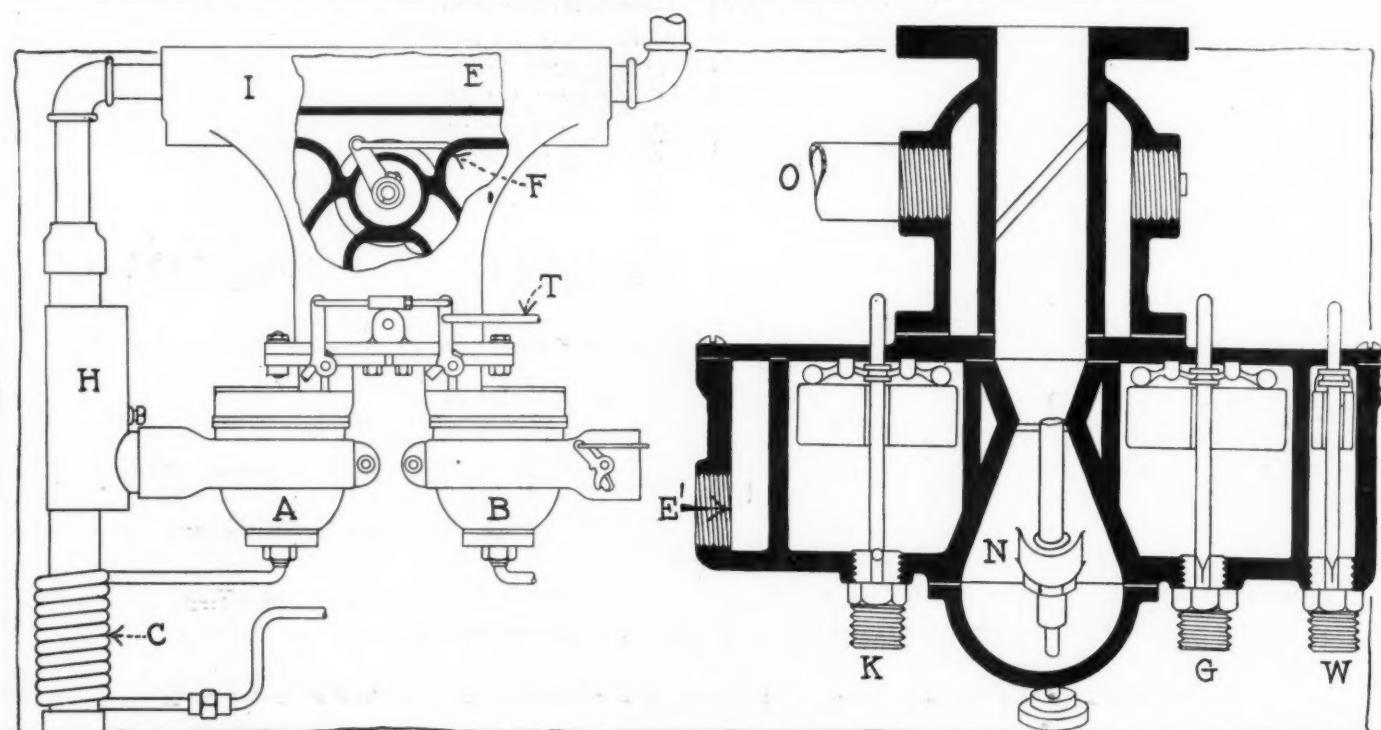


Fig. 8—Walker two-fuel carbureter. Fig. 9—Hampton kerosene carbureter